Strategic Carbon Management within the UK Higher Education Sector

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Abstract

Climate change and the rapid rise of greenhouse gas emissions are emerging as one of the greatest challenges for the modern world. Organisations are under increasing pressure from governments and stakeholders to reduce carbon emissions from their business operations for climate change mitigation. The Higher Education (HE) sector has significant social, environmental and economic impacts alongside a key leadership role in society and is not exempt from challenging carbon reduction targets, as outlined in the UK Government's Climate Change Act 2008. In 2005, total HE carbon emissions were 3.339 $MtCO_2$, a rise of 33% since 1990. In 2012-13, Higher Education Institutions (HEIs) consumed 7.9 billion kWh of energy and produced 2.3 million tonnes of carbon emissions, which strengthens the role of HEIs in implementing strategic carbon management (SCM). The term 'carbon management' is popular in the grey literature and policy landscape from operational perspective, but 'strategic carbon management' is an under-researched area, especially in the context of HE sector. Therefore, the central aim of the research is to explore if and how universities are responding to the challenge of climate change by implementing strategic carbon management.

The research adopted a mixed-methods approach including content analysis of universities' carbon management plans (CMPs), semi-structured interviews with key stakeholders, a quantitative survey of the HE sector and an in-depth case study of De Montfort University's (DMU) carbon management process. The study found that while the HE sector as a whole has demonstrated both policy and strategy commitment to carbon management, the performance of individual universities varies significantly and there is often a need to embed the process more effectively within the whole organisation. Despite a need for improvement, various initiatives distinguish the performance of carbon management in HE, but there is a long way to go. This has been complicated as this research was conducted against the backdrop of seismic policy changes within the HE sector. This shifting policy context is explored and examined and in part explains why financial savings and policies are the most important drivers for SCM. On the other hand, universities are facing barriers such as lack of time and resources (HR), complex buildings stock, estate development and business growth, lack of capital funding, priority to the core business and conflicts, lack of senior management leadership and lack of strong policy framework. This study identified seven factors for successfully embedding SCM. These are: (1) Senior management leadership, (2) Funding and resources, (3) Stakeholder engagement, (4) Planning, (5) Governance and management, (6) Responsibility, and (7) Evaluation and reporting. The research findings are pertinent for HE and broader public sector practitioners both in UK and abroad as successful carbon management is crucial. A strategic carbon management framework is developed for improving and embedding SCM in universities and other public sector and business organisations. The study concludes with practical and policy recommendations as well as directions for the future research work.

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Dedicated to my parents: Mazhar-ul-Islam & Shahnaz Mazhar

Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

This chapter provides an introduction to the thesis. It starts with a brief summary of the research background including an over-arching research motivation, which is global climate change and associated carbon emissions. The research focus is justified and the research aim and objectives are set. A brief summary of the proposed research methodology is presented along with the thesis structure.

1.1. Research background

Climate change is one of the greatest challenges facing the world today and man-made greenhouse gases (GHGs) are its main cause (IPCC, 2013a; HM Government, 2006). According to the fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC), the increase in anthropogenic greenhouse gases (GHGs) has driven a rapid rise in the global temperature (IPCC, 2007b). If the current emissions trend continues, the temperature is likely to exceed 2˚C and could possibly exceed 4˚C by 2100. At the very heart of the response to climate change, substantial and sustained reductions of greenhouse gas emissions are required (IPCC, 2013a). Carbon dioxide (CO_2) has been responsible for over half of the enhanced greenhouse gases effect in the past and is likely to remain the same in future (IPCC, 2007a). The Stern Review report suggests that a 25% reduction below current levels of emissions is required to stabilise global CO_2 concentrations at levels that will not have very adverse impacts on climate. Also, the costs of not acting on climate change are greater than the costs of acting now and it demands an urgent global response (Stern, 2006).

The UK was the first country to set the legally binding carbon reduction targets under its Climate Change Act (CCA) 2008. The main aim is to improve carbon management and help transition to a low-carbon economy. The UK aims to reduce its greenhouse gas emissions by at least 80% (from the 1990 baseline) by 2050 and 34% by 2020. Moving to a more energy efficient and low-carbon economy will help the UK in meeting these ambitious carbon reduction targets (HM Government, 2013b). In 2012, the UK emissions of the six greenhouse gases covered by the Kyoto Protocol were 571.6 million tonnes carbon dioxide equivalent (tCO_2e), which was 3.5% higher than the 2011 figure of 552.6 million tonnes (DECC, 2013a). The provisional GHGs and CO_2 emissions from 1990 to 2012 are shown in Figure 1.

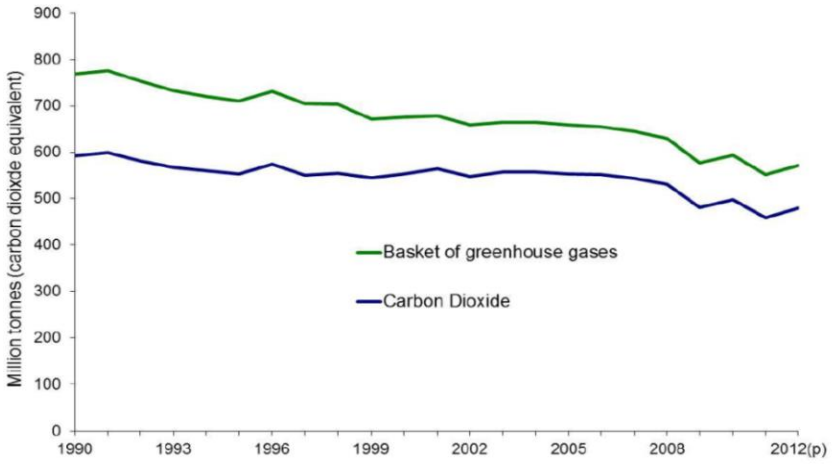

Figure 1: GHG emissions from 1990-2012 (DECC, 2013a)

Reducing carbon emissions from organisations is key, as organisations (including commercial, public and industrial) account for significant energy usage and emissions. The public sector (including local authorities, hospitals, universities and colleges) has a vital role to play based on its significant carbon footprint. GHG emissions by the UK public sector bodies from the use of electricity and fossil fuels in 2009/10 are estimated to be 16.7 - 23.5 million tCO_2e (Bryan et al., 2011). HM Government (2006) claims that the public sector carbon emissions have fallen down by 28% below 1990 levels by 2004 and new measures introduced in the Climate Change Programme 2006 aim to keep these emissions at about the same level, given that electricity consumption per unit of floor area has increased. Therefore, the public sector bodies can have a significant impact on carbon management across the country (Rugg, 2013).

The Higher Education (HE) sector is an important part of the public sector and is not exempt from the challenge of carbon management. It needs to play its part in meeting the national targets and demonstrating leadership, because of its wider impact on society and contribution to carbon emissions. In 2005, the total HE sector carbon emissions were 3.339 $MtCO_2$, a significant rise of 33% as compared to 1990 baseline (HEFCE, 2010b). Table 1 presents an overview of its scale and impact in 2012-13. The UK HE sector is growing in all aspects (Ward et al., 2008) and the expansion in the sector offers many challenges (Universities UK, 2012).
In 2012-13, Higher Education Institutions (HEIs) consumed 7.9 billion kWh of energy and produced 2.3 million tonnes of carbon emissions. Table 2 reports the total number of universities in UK. Most of the UK universities are independent public bodies having a legal status of ‘charities’ (Hoskin and Thomas, 2015). They receive public funding directly from one of the funding councils in addition to student fees. However, in recent years, changes in the UK HE sector have made universities to operate like businesses for profit (Robinson et al., 2015).

Information summary	UK HE statistics for 2012/13
Number of students	2,340,275
Number of staff	382,515
Number of buildings	15,431
Total Gross Internal Area (GIA)	26,696,674 m^2
Energy consumption	7.9 billion kWh
Water consumption	24 million m^3
Carbon emissions	2.3 million tonnes CO_2
Waste Total	514,000 tonnes
Waste Recycled	389,000 tonnes

Table 1: Higher education statistics (HESA, 2014a) and (HESA, 2014b)

England	Wales	Scotland	Northern Ireland	United Kingdom
130	9	18	4	161

Table 2: Number of universities in the UK and devolved administrations (HESA, 2014b)

HM Government (2006) reports that the HE sector consumes 5.2 billion kWh of energy at a cost of over £200m and spends £3bn on purchasing goods and services every year, while providing education to two million students and employing about 300,000 staff members. These trends contradict the national and sector plans for emissions reductions in all sectors and therefore, offer a reason for action on scale (Ward et al., 2008). The sector baselines are 1.831 $MtCO_2$ in 1990 and 2.124 $MtCO_2$ in 2006 for scope 1 and 2 emissions (HEFCE, 2010b) (see Figure 2). The World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) classified scope 1 as direct carbon emissions that occur from sources owned or controlled by the organisation and scope 2 accounts for emissions from the generation of purchased electricity. Scope 3 is all other indirect emissions that arise as a consequence of various organisational activities, but occur from sources not owned or controlled by the organisation (WRI & WBCSD, 2004).

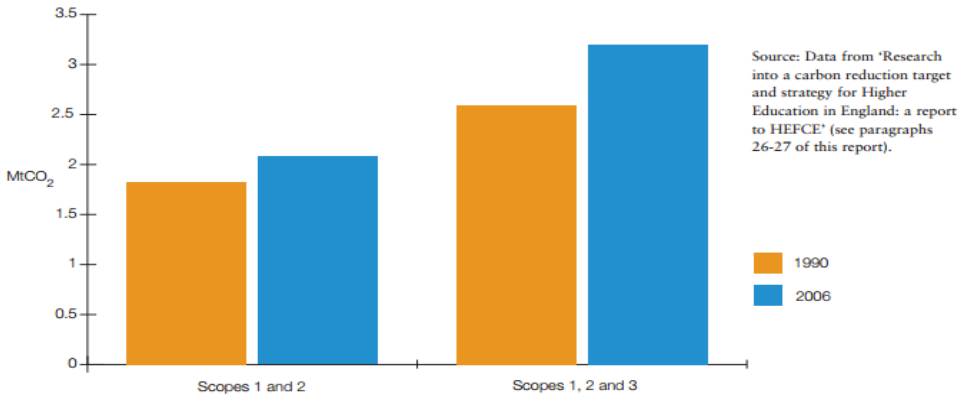

Figure 2: Baselines for 1990 and 2006 in the HE sector (HEFCE, 2010b)

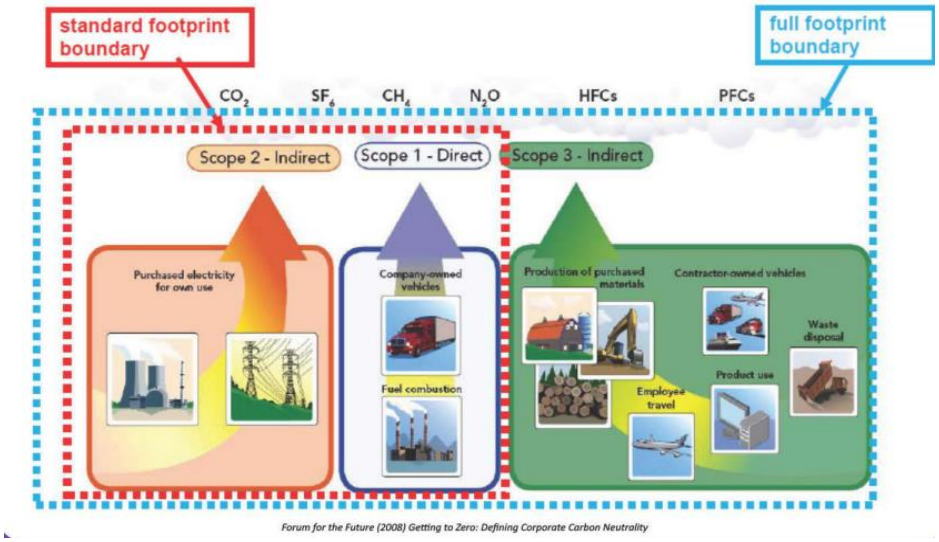

Figure 3: Classification of carbon emissions (Burtis and Watt, 2008)

The HE sector has an opportunity to build a sustainable society by equipping future generations with knowledge and leadership, and influence local, national and international communities (HM Government, 2006). HE has adopted the same carbon reduction targets as that of the UK national targets. The Higher Education Funding Council for England (HEFCE) (2010b) signalled to HEIs a more demanding approach to carbon management and the need for effective strategies and plans. The grant letter from the Secretary of State for Innovation, Universities and Skills to HEFCE of 18 January 2008 and 21 January 2009 had specific requirements for incorporating the Climate Change Act 2008 in future HE policies. The HE sector in England agreed to meet the carbon reduction targets in scopes 1 and 2 of 34% by 2020 and 80% by 2050 against a 1990 baseline. Against a 2005 baseline, this is equivalent to 43% reduction by 2020 and 83% by 2050; originally these figures were 48% and 84% respectively. These targets are proposed only for scope 1 and 2 emissions, because there is a degree of uncertainty for scope 3 emissions for 1990 (HEFCE, 2010a). This overarching policy made carbon management one of the important issues for universities. In 2011, when this research commenced, HEFCE had strong hold on how universities were funded and how they spend that funding. Since the change in funding regime within HE, HEFCE still have presence, but it has no longer the same influence on universities because the main source of income is now tuition fees.

1.2. Research focus

"Carbon management means the measurement and management of the six greenhouse gases covered by the Kyoto Protocol, including carbon dioxide (CO_2)" (Chan, 2009, p.11). The strategic importance of carbon is expected to grow further over the next ten years and carbon management is becoming a strategic issue for business organisations (Carbon Disclosure

Project, 2010). Universities are operating like business organisations (Robinson et al. 2015) and are reporting GHG emissions to measure their sustainability (Klein-Banai and Theis, 2013). CO_2 is the main GHG and accounts for about 83% of the UK anthropogenic (man-made) GHG emissions in 2011 (DECC, 2013a). Universities can contribute to realise the notion of sustainable development by developing low carbon campuses and it can help build a conservation-minded harmonious society (Zeng and Liu, 2013). Therefore, the HE sector is being encouraged to take a leading role in implementing carbon management as, it is not only a significant contributor of carbon emissions, but also due to the privileged position universities have as centres of research and teaching excellence and in cultivating 'thought leaders' of future (HEFCE, 2010b). HEFCE (2009a) summed up the key strategic role of universities in mitigating climate change in HEFCE (2009*). "It is crucial that the sector contributes strongly to sustainable development. It can do so by training and expanding minds; researching answers to challenges and informing public policy; showing its own understanding and commitment through careful campus management; and by being a responsible employer and active member of the business and local community"* (HEFCE, 2009a, p.1).

Universities may therefore play a key role in the UK's transition to a more sustainable low carbon future, but some argue that their response to climate change is too slow and not effective enough (People and Planet, 2007). The case of HE energy and carbon reduction is more complex due to heterogeneity of the sector (Altan, 2010). Universities struggle to respond to their commitments and, to date; no university has managed to align its 'core business' with the principles and practice of sustainable development (Tilbury, 2010) and carbon management is part of that. This research seeks to address this issue of organisation wide strategic carbon management. The research focus on 'carbon' is compatible with and does not compromise other environmental issues and broader notion of sustainability. Dembo (2008) refers carbon[1] as shorthand for GHGs and sustainability and argues that it is linked with almost all of organisational activities. The operational boundary of emissions considered in this research includes emissions from all of the business activities of a university, i.e. scope 1, 2 and 3.

Strategic carbon management is an under-researched area with little empirical research available (Wahyuni and Ratnatunga, 2015; Robinson et al., 2015; Mazhar et al., 2014). There seems to be

[1] The terms 'carbon', 'carbon emissions' and 'CO_2' refer to the management of greenhouse gas emissions as defined by the Kyoto Protocol. However, the term 'carbon' is mainly used in this research.

hardly any academic literature on strategic carbon management (SCM) in public and HE organisations, which is one of the gaps in the existing literature. Robinson et al. (2015) support this argument that very few papers have focused on HE carbon emissions and their management. In contrast, there is practitioners' and policymakers' literature available in the form of carbon management plans and strategies of universities and beyond. This is because of HEFCE taking a lead on carbon management in the HE sector and raising the profile of carbon management (Robinson et al., 2015). These strategies and plans are quite similar in the design to each other. Unfortunately, these do not address in-depth issues being faced by universities. There is also a gap in the consideration of indirect scope 3 carbon emissions (product and services etc.) in carbon management strategies. There is a need to bridge this gap for a comprehensive and integrated approach to carbon management (Lozano, 2011). Thus, it can be concluded that SCM is an under-researched and under-developed area in the academic world (Mazhar et al., 2014). It is evident that the literature on SCM at the whole organisation level is sparse and provides an opportunity for further research. Furthermore, much of the literature is focussed on wider sustainability related issues in HEIs (Lozano, 2013; Tilbury, 2011; Wright, 2010; Velazquez et al., 2006; Sharp, 2009; Shriberg, 2000) and greening the campuses or academia (Zhang et al., 2011; Tilbury, 2010; Lukman et al., 2009; Dahle and Neumayer, 2001). However, this has ignored carbon management which is a main theme of sustainable development of universities. This research is concerned with looking at the SCM from a whole organisation perspective and investigates the role of different stakeholders as significant work remains before institutions can integrate system-level analysis into GHG management (Williamson, 2012). Freeman (1984, p. 46) defined a stakeholder as *"any group or individual who can affect or is affected by the achievement of the organization's objectives".* Lozano (2006) identified staff (both academic and administrative), senior management and students as the key stakeholders of a university. However, the question of how universities can effectively respond to the challenge of climate change by implementing SCM is still unanswered.

In order to clarify the theoretical context, this research has not drawn upon the strategy and strategic management literature. There is vast literature on strategy and strategic management and historically, it is well established (for example, Ansoff, 1980; Eisenhardt, 1999; Heracleous, 1998; Mintzberg, 1985, 1987; Porter, 1996, 2008). This research is not aimed to analyse the strategic management process of universities. It aims to explore how universities are managing carbon emissions strategically. Therefore, to set the context, strategic carbon management (SCM) is defined as the management of carbon emissions within an organisation in a strategic way, i.e. a long term view and aligned with other core business activities.

1.3. Research aim and objectives

The main research question therefore centres on the role of universities and whether and how they demonstrate leadership with regards to climate change mitigation, specifically around their approaches to carbon management. The specific aim of the research is to explore if and how universities are responding to the challenge of climate change by implementing strategic carbon management. Five objectives underpin this aim;

- To analyse the global, EU and UK policy landscape around climate change and carbon management and its implications for the UK HE sector.
- To assess university levels of compliance and adoption of the latest carbon management policies and explore the current state of strategic carbon management in HE.
- To explore the drivers for and barriers to strategic carbon management within the HE sector.
- To identify critical success factors for effectively implementing and embedding strategic carbon management in universities.
- To develop a best practice framework for strategic carbon management and recommendations for HE and other public sector organisations.

1.4. Summary of the research methodology

The methodology designed for this research, as detailed in Chapter 4, is guided by the aim and objectives. This research employs critical realism as an underpinning philosophy. As the focus of the research is to create a deeper understanding of the SCM process, a mixed methods approach is adopted. Predominantly, it is of qualitative in nature, because it majorly deals with the qualitative factors around the SCM process. This research adopted an innovative social science approach, systematic combining, which refers to the simultaneous integration of a theoretical framework (in this case strategic carbon management), empirical fieldwork (semi-structured interviews and a survey to elicit HE perspectives) and a case study analysis of De Montfort University (DMU). Using 'abduction' - as distinct from both induction and deduction – the main purpose of the study was to explore the relationship between 'everyday language and concepts' of SCM within universities.

The data collection and analysis was carried out in two iterative phases. The first phase of the research (Chapter 5 and 6) consists of content analysis of universities' carbon management plans (CMPs) and semi-structured interviews with university managers and other key individuals from the HE sector organisations. This led to the development of key themes (thematic frameworks), representing the key issues surrounding the SCM process. The second phase of the research, as presented in Chapter 5 (combined with the content analysis) and 7

entails the quantitative survey of the UK HE sector and an in-depth case study of DMU respectively. The data collection methods in the case study were semi-structured interviews with the middle and senior managers in different departments, content analysis of the CMP, relevant policies and strategies and observation of meetings.

The first phase of the research aimed to develop the basis of a structured and focused approach in the second phase. The second phase pursued the refinement and validation of the first phase findings with more depth. For example, the survey was designed based on the first phase and the findings are fed into the case study for in-depth exploration. Then, the findings from both phases of the research are evaluated and discussed in relation to the previous literature (Chapter 3) to meet the aim and objectives. A framework for SCM is developed to produce guidelines for universities and other public sector organisations to improve and embed strategic carbon management.

1.5. The thesis structure

The remainder of this thesis is divided into eight chapters.

Chapter 2: Universities and the rise of carbon: Policy and historical context

This chapter sets out the research context by reviewing the global, EU, national and the public and HE policy context of climate change and carbon management. It tracks the shift towards carbon management and explores the policy significance, requirements and expectations on universities. It asks to what extent the rise of student as consumer is changing the way universities are prioritising their activities (Objective 1).

Chapter 3: Research issues and theoretical background

This chapter introduces the theoretical background for the research through a critical review of the literature around organisations and carbon management. It identifies the changing context of the public sector in which universities operate in alongside critically examining the concept of carbon management in HE and to what extent carbon management is strategic.

Chapter 4: Research methodology

It presents the overall research design and outlines the chosen research approach and methods for data collection in order to meet the research aim and objectives. It also discusses the validity and reliability of the findings.

Chapter 5: Strategic carbon management: State of the UK Higher Education sector

Chapter 5 reviews the current levels of policy adoption and compliance within the UK HE sector by presenting the results from a quantitative survey carried out within the UK HE sector. It helps inform the wider understanding of the current state of SCM at the HE sector level by presenting a review of carbon management plans and their key themes. (Objective 2 & 3)

Chapter 6: Drivers and barriers to strategic carbon management

This chapter follows on from the previous chapter and explores in more depth the current state of SCM in the HE sector, its drivers for and barriers to change and ranks them. This time though through the analysis of semi-structured interviews with senior and middle managers in universities and the other HE sector organisations in the UK. It also reflects on the critical success factors for SCM. The input is also taken from the content analysis and the survey. (Objective 2 & 3)

Chapter 7: Strategic carbon management at De Montfort University: A case study

It provides an in-depth case study of DMU to find out what is currently happening in relation to organisation wide SCM. The case study explores how a university implements SCM and identifies various features and processes for effective SCM i.e. critical success factors in combination with the previous chapters. It explores whole organisation approaches to SCM keeping in view all sources of carbon emissions and understanding how stakeholders understand and approach to it. (Objective 4)

Chapter 8: Strategic or pragmatic? A framework for strategic carbon management

This chapter consolidates the analysis and findings from the previous three chapters and proposes a SCM framework for setting future guidelines and lessons to improve and embed SCM within HE as well as broader public sector organisations nationally and internationally. It also presents specific recommendations for practitioners and policymakers. (Objective 5)

Chapter 9: Conclusions

The last chapter reflects on the key research findings and how the specific objectives are met. It highlights the original contribution to knowledge arising from this research. It addresses the strengths and weaknesses of the study, followed by the direction for future research work.

Chapter 2: Universities and the rise of carbon: Policy and historical context

In order to contextualise this research, an understanding of carbon management policy in higher education (HE) sector and its response to climate change is necessary.

2.1. Introduction

This chapter presents the background to carbon management policy in the UK HE sector and includes brief overview of the global and European Union's (EU) climate policy. This chapter identifies implications for the public sector, analyses the policy drivers and responses offered by the HE sector in delivering the UK targets. The history and emergence of carbon management in the context of wider climate policy is explored including how the policy landscape has changed. The analysis focuses on the policy context of HE and is predominantly focused on England, located in the wider UK context. The English HE sector is the biggest part of the UK HE sector (Universities UK, 2012). In Scotland, Wales and Northern Ireland, devolved administrations are responsible for policy issues, and their respective Assemblies have the powers to develop laws and regulations for the environment to complement the national policies (HM Government, 2014). In HE, climate policy is UK based and the funding bodies of devolved administrations have different approaches to respond to energy and carbon for delivery (James and Hopkinson, 2011). A timeline approach was adopted for this review and to describe the rise of carbon management from 1990 onwards. The Head of Estate Management and a Manager from two of the key HE organisations and the Head of government policy department (DECC) were contacted either to explore missing information or clarify policy issues.

2.2. The changing face of climate policy

Before reviewing the UK HE policy framework, a review of global, EU and UK climate change policy is necessary to understand the wider context universities are operating in.

2.2.1. Global climate change policy

Recognising the need to establish scientific evidence and provide policymakers with regular assessments of climate change, the Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) (IPCC, 2013b). The IPCC published its First Assessment Report in 1990, which played an important role in the development of United Nations Framework Convention on Climate Change (UNFCCC) and this Report provided global policy framework for addressing the issue of climate change. In fact, it was that who first calculated the 60% figure for emissions reduction required to stabilise GHG emissions at 1990 levels (Breidenich et al., 1998). In 1992, the industrialised countries signed the UNFCCC at the United

Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (Rio Earth Summit) to limit average increase in global temperature for climate change mitigation (UNFCCC, 2014). According to the Department of the Environment, Transport and the Regions (DETR), all countries agreed to bring their emissions to 1990 levels by 2000 under the UNFCCC (DETR, 2000). After the Rio Summit, IPCC published the Second Assessment Report in 1995; followed by the Third in 2001, the Fourth in 2007 and the Fifth in 2013. Each report strengthened the argument for taking urgent action globally to address climate change and helped accelerate it on the political agenda.

By 1995, the UNFCCC signatories realised that emissions reduction provisions had been inadequate and did not include binding reduction targets. Therefore, they adopted the Kyoto Protocol to strengthen the response to climate change (UNFCCC, 2014). The Kyoto Protocol legally binds the developed countries to carbon reduction targets of up to an average of 5%, as compared to 1990 during 2008-2012 (UNFCCC, 2013). In Doha, in December 2012, an amendment to the Kyoto Protocol was made and the second commitment period was launched from 2013-2020 (UNFCCC, 2013). Furthermore, IPCC's Fifth Assessment Report confirmed that warming in the global climate system is unequivocal. The research conducted under the IPCC enhanced scientific evidence and understanding of the climate system and the role of GHGs. These IPCC reports demand urgent attention of global policymakers and general public (IPCC, 2013a). The IPCC is now in Sixth Assessment cycle. Figure 4 provides summary of IPCC reporting and major events of UNFCCC.

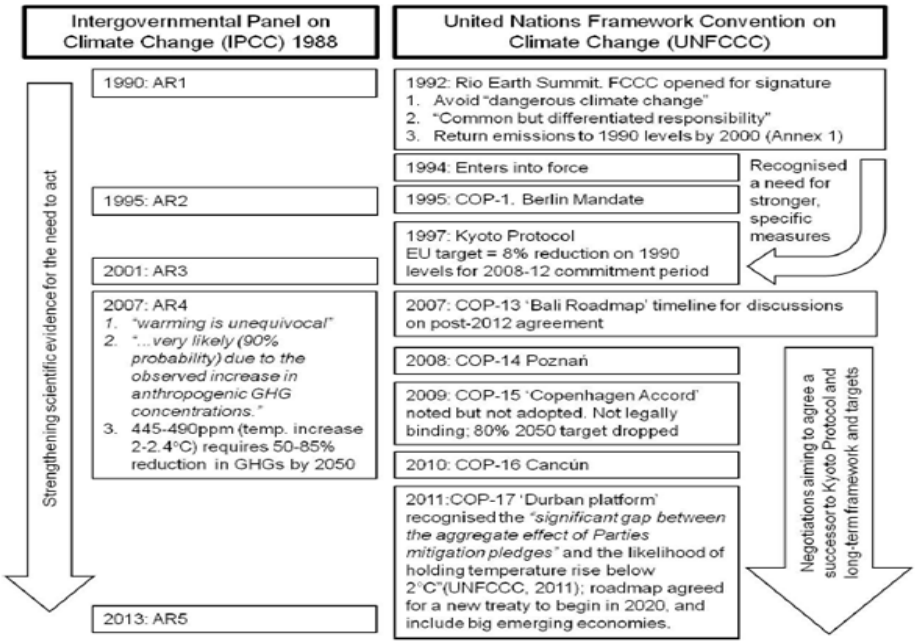

Figure 4: Summary of IPCC reporting and UNFCCC process (Bailey, 2012)

Under the UNFCCC, various Conference of Parties (COPs) have been held to discuss global response to climate change (see Figure 4). In November - December 2015, a hugely significant Conference of Parties (COP21) was held in Paris, France where over 190 developed and developing nations gathered from around the world to achieve a legally binding and international agreement on reducing greenhouse gas (GHG) emissions to avoid climate change. The Paris Climate Agreement was aimed to keep the global warming below 2°C and 134 Parties have ratified it (UNFCCC, 2016). Following the Paris Climate Agreement, COP 22 was held in Marrakech, Morocco in November 2016 to demonstrate to the world that the implementation of the Paris Agreement is underway. The backdrop to all these climate conferences is the historical work of the IPCC and the United Nations (UN).

2.2.2. The European Union climate change policy

The European Union (EU) has been committed to tackle climate change as one of its strategic priorities. It has set its targets for reducing the GHG emissions and influenced climate change related initiatives since 1991, when its first 'community strategy' was published to improve energy efficiency and limit carbon emissions (EC, 2014c). Under the Kyoto Protocol, 15 EU countries (EU-15) (that were EU members before 2004) pledged to reduce their collective carbon emissions of 8% below 1990 levels by the period 2008-2012. The monitoring of emissions and projections indicated that the EU-15 was on track to meet this target. Most of the EU member states that joined the EU since 2004, have now individual carbon reduction targets under Kyoto Protocol (EC, 2014d). For example, the UK set its target of 12.5%. As part of the transition to the future low carbon agenda, EU is taking part in a second phase of the Kyoto Protocol (2013-2020) (EC, 2014c). In June 2000, the EU set an example through policy-making and developed its first 'European Climate Change Programme' (ECCP I) for climate change mitigation. One of the most important initiatives which came out of the ECCP 1 was the EU Emissions Trading System (EU ETS) launched in 2005. This is the world's first and biggest 'cap and trade' system to reduce emissions from energy intensive sectors covering more than 11,000 power stations and industrial plants in 31 countries including the airline industry (EC, 2014b). This is now in its third phase running from 2013 to 2020.

The EU launched its second European Climate Change Programme (ECCP II) in October 2005. It is central to the EU climate policy and sets the headline targets of 20-20-20 for 2020: (i) an EU based target for greenhouse gas reductions of 20% as compared to 1990; (ii) 20% share from renewable energy sources in the total EU energy consumption with specific targets for member states; (iii) 20% improvement in the EU's energy efficiency (EC, 2013b). The EU

offered to increase its emissions reduction to 30% by 2020 and major developed and developing countries are encouraged to commit to global GHG reduction plan through policies. 30% reduction target is a win-win situation for EU providing a chance to regain its position as a global climate leader (WWF, 2014). The EU developed the policy frameworks for 2050 and 2030 with carbon reduction targets, as presented in Table 3 (EC, 2014a). Every EU country has to implement policies in response to EU legislations. The EU has been the major driver of global policy for more than 15 years. The UK climate policy is predominantly driven by the global and the EU polices. UK leaving the EU, as a result of the referendum, may have damaging consequences for carbon management unless the government develops its targets and policies as an alternate. Table 3 summarises the EU climate policies.

Year	Policy framework	Summary of framework
2000	The first European Climate Change Programme (ECCP I)	Setting actions to implement the Kyoto Protocol. Involves all the relevant stakeholder groups working together.
2005	The second European Climate Change Programme (ECCP II)	Explored cost-effective options for reducing GHGs New working groups are established, covering carbon capture and storage, CO_2 emissions from light-duty vehicles, aviation emissions, and climate change adaptation. The actual implementation of the priorities identified in the first phase.
2009	The 2020 climate and energy package	'20-20-20' targets: 20% reduction in the EU GHGs from 1990 levels. 20% energy from renewable resources. 20% improvement in the energy efficiency.
2011	Roadmap for moving to a low-carbon economy in 2050	80% carbon reduction by 2050 below 1990 levels. Setting 40% carbon reduction by 2030 and 60% by 2040. Power generation, industry, transport, agriculture, buildings and construction sectors.
2014	2030 framework for climate and energy policies	Progress towards a low-carbon economy. 40% emissions reduction below the 1990 levels by 2030. Increasing the share of renewable energy to at least 27%.

Table 3: The EU climate change policy framework

2.2.3. The UK climate change and carbon management policies

The UK is facing risks of climate change and energy security. It has national interest in tackling these global issues (HM Government, 2011). Since the late 1980s, the UK government has been at the forefront of the international climate policy initiatives (Eyre and Staniaszek, 2005) and has been trying to achieve carbon reductions to be a global leader (HM Government, 2011). In 1973, the UK government promoted systematic approaches to energy management and encouraged large energy consumers and the public sector to employ energy managers for implementation (Eyre and Staniaszek, 2005). By the 1980s, which was the 'golden age' of energy efficiency, the government aimed to deliver carbon reduction targets via improved

energy efficiency (Mallaburn and Eyre, 2013). This era observed a shift in emphasis from 'energy conservation' to 'energy efficiency' (Owen, 1999) and the period, 1989 to 1992, saw the rise of climate change impacts (IPCC, 1990).

1990-2000

The first outline of the UK climate change programme emerged in 1989 (Currie, 1989) when the government developed an environmental strategy and the white paper 'This Common Inheritance' to integrate the environmental policies into the government operations. A commitment to bring carbon emissions back to 1990 levels by 2005 was made (Mallaburn and Eyre, 2013). The profile of climate policy started rising in early 1990s when a set of new policy initiatives was introduced and by 2000s, the UK had a set of carbon reduction policies in place (Bowen and Rydge, 2011). The government created the Energy Saving Trust, a not-for-profit organisation and this was central to the UK's climate change programme. However, its funding was withdrawn in 2011 (Eyre et al., 2011). The UK's first climate change programme was published in January 1994, identifying its commitments, and has been under review since then. This appeared to be successful and in 2000, emissions were targeted to be about 13.5% below 1990 levels (DETR, 2000). In 1997, the newly elected government promised a stringent 20% reduction by 2010 and while many of the previous policies were reviewed. 1990-2000 was the decade when climate policies started building up around 'carbon management' due to increasing carbon emissions, policies and targets.

2000-2016

The UK continued with a positive approach of policies and programmes and actions taken throughout the 1990s significantly reduced emissions (DETR, 2000). In 2000, the UK's Climate Change Programme was published developing a strategic approach to address climate change. It examined how the UK could reach its Kyoto and national target of 20% by 2010 as compared to 1990. As part of this programme, the Carbon Trust was launched to offer advice and support to organisations on tackling CO_2 emissions (DETR, 2000). Despite recent progress, a further step change is needed to meet the targets (Bowen and Rydge, 2011). A tax on energy use (electricity and fuel bills) in businesses and the public sector, the Climate Change Levy (CCL), was introduced in 2001 to encourage energy and carbon reductions. It offers organisations an opportunity for reduced levy if they enter into the Climate Change Agreements (CCAs) (HM Government, 2013a). CCAs are voluntary agreements made by UK industry and the Environment Agency to reduce energy and emissions. In return, operators receive a discount on the CCL. CCL is applicable to universities, but is described as a poor incentive for improving energy efficiency (Eyre and Staniaszek, 2005). For businesses, a UK Emissions Trading Scheme (ETS) began in March 2002 to secure significant carbon reductions equivalent to 3.96

million tonnes in 2006. The organisations (direct participants) could bid emissions reductions over the five year period of 2002-2006 and get a share of £215 million financial incentive from the government for delivering these reductions (National Audit Office, 2004). This scheme has been a novel economic instrument having two stages of auction and trading.

The Energy White Paper 2003 was the UK government's first statement on the direction for energy policy and to put itself on a path towards carbon reduction of 60% by 2050 (Department for Transport, 2003). In 2004, the government reviewed its Climate Change Programme to address policy weaknesses, as it became apparent that the UK was going to miss its target of 20% (HMSO, 2007). This review formed the basis of the Climate Change Programme 2006 and set policies and actions to meet the targets (HM Government, 2006). The UK government spent three years establishing an energy efficiency policy and Energy Efficiency Action Plan that developed a coherent framework for implementation of energy reduction. This Action Plan was reinforced in 2006, by the Stern Review Report (Stern, 2006). At this point, the development of new carbon management policies started and the government signed the development of the EU Emissions Trading System (National Audit Office, 2004). The first phase of the EU ETS started in January 2005 and covered 11,000 sites with a thermal input of 20MW or more, about 40% of the EU emissions (EC, 2013a). While not all UK universities have to comply with the EU ETS, the Estates Management Record (EMR) for 2012-15 reported that 21 energy intensive universities are participating in it. The EU introduced the Energy Performance of Buildings Directive (EPBD in 2003 for existing and new buildings as a driver for carbon management. It sets minimum energy performance standard for buildings having floor area of over 1000 m^2 and requires the owners or landlords to provide the Energy Performance Certificates (EPCs), showing the energy performance (Building Research Establishment, 2004). Public buildings including universities must show Display Energy Certificates (DECs) to indicate their actual energy performance to raise public awareness on a scale of A (most efficient) to G (least efficient) (DECC, 2013b). According to the Department for Communities and Local Government (DCLG), DECs are applicable to buildings with a usable floor area over 250m^2 and are occupied in whole or part by public authorities and visited by the public (DCLG, 2013).

The Climate Change Act 2008, carbon budgets and key policy tools

In 2008, the UK government passed the world's first legally binding framework, the Climate Change Act (CCA) to improve carbon management and help the UK transition to a low-carbon economy. Targets of an 80% reduction of CO_2 emissions by 2050 and 34% by 2020 against 1990 were set (HMSO, 2008). It became the overarching national policy driver for public and private sectors. The CCA 2008 introduced carbon budgets that provided limits on emissions and

can be produced in a successive five-year period. The first three carbon budgets (2008-12, 2013-17 and 2018-22) were introduced in 2009 and require a reduction of 34% by 2020 in comparison to 1990. The fourth carbon budget (2023–27) was set in June 2011 and requires 50% reduction (HM Government, 2011). These four carbon budgets have a commitment to halving the UK emissions (HM Government, 2013c). The Committee on Climate Change (CCC) was established as an independent and statutory body as part of the CCA 2008 to provide advice to the national government (CCC, 2008). The UK has met its first carbon budget and is on track to meet the second, but it is currently not on track to meet its third and fourth carbon budgets (CCC, 2013). There is a need for significant carbon reductions over the next two years; otherwise there will be serious consequences. It is necessary to develop and implement further policy measures (CCC, 2013). The fifth carbon budget (2028-32) was announced by setting a target for the emissions to be 57% (CCC, 2016).

	First carbon budget (2008–12)	Second carbon budget (2013–17)	Third carbon budget (2018–22)	Fourth carbon budget (2023–27)	Fifth carbon budget (2028-32)
Carbon budget level (million tonnes carbon dioxide equivalent ($MtCO_2e$))	3,018	2,782	2,544	1,950	1,765
Percentage reduction below base year levels	23%	29%	35%	50%	57%

Table 4: Carbon budgets framework (DECC, 2011a) and CCC (2016)

In October 2008, the Department of Energy and Climate Change (DECC) was formed and a year later, the government published the 'Low Carbon Transition Plan' setting out the UK's first low carbon plan to 2020. The plan investigates how to deliver carbon reductions of 18% on 2008 levels (over a one third reduction on 1990 levels) to meet the first three carbon budgets (HM Government, 2009). The government published a 'Carbon Plan' in 2011 to set policies for delivering the low carbon future and making energy efficiency a key strategy across all sectors including HE (DECC, 2011a). In 2009, the DCLG announced the proposal for working towards new non-domestic buildings being zero carbon from 2019 and the public sector will lead the way from 2018 (DCLG, 2010). However, the compliance reporting still exists. In 2010, the government designed Carbon Reduction Commitment Energy Efficiency Scheme (CRC EES) to encourage industry, businesses, the private and public sector to reduce emissions, by having half-hourly metered electricity of at least 6,000 megawatt-hours (MWh) (Environment Agency, 2013). The participants have to measure and report emissions and buy allowances equivalent to previous year's emissions. This was a cap and trade scheme accompanied by a Performance League Table (PLT) (EA, 2013). Two PLTs were published and the PLT was abolished. The incentive part of the scheme was also removed. Practitioners criticised this and for the scheme

being complex and its continually changing nature. The scheme is now a carbon tax (Sood, 2013) and there is a threat that it might get scrapped (Mallaburn and Eyre, 2013).

In 2010, the government introduced the Feed-in Tariffs (FITs) and Renewable Heat Incentive (RHI) schemes to encourage uptake of renewable technologies in domestic sector, communities, businesses and the public sector through financial incentives (DECC, 2014a). In 2011, RHI was introduced for the non-domestic sector (DECC, 2014b). Since then, incentives are significantly reduced. In June 2014, in response to the EU's Energy Efficiency Directive (EED), the UK government announced the Energy Savings Opportunity Scheme (ESOS), a mandatory energy assessment and saving identification scheme for large organisations (DECC, 2014c). Some universities will be within the scope of ESOS. Where a university derives more than half of its income from private sources, such as tuition fees, it may not need to comply. There has been confusion and questions were raised whether public bodies and universities have to comply or not (EAUC, 2014a). With regards to tuition fees, the definition of 'public funding' and 'private funding' is unclear. The analysis suggests that this shifting policy context resulted in a raft of legislations and policy tools that organisations such as universities must comply (see Table 5).

Policy instruments	Nature of policy impact	Carbon management opportunities
Climate Change Act 2008	80 % carbon reduction by 2050 and 34 % by 2020 against a 1990 baseline	Long-term legally binding framework to act on carbon emissions
Carbon Reduction Commitment Energy Efficiency Scheme (CRC EES)	Legal action for non-compliance in the statutory energy efficiency scheme	Good publicity and enhanced reputation and financial savings
Climate Change Levy (CCL)	A tax on the taxable supply of specified energy products	Energy savings can reduce carbon emissions and save energy bills.
EU Emissions Trading System (EU ETS)	Cap and trade emissions trading system in the EU	A system to combat climate change and cost-effective carbon reduction in energy intensive organisations
Energy Performance of Buildings Directive (EPBD)	Buildings have EPCs and DECs to show energy performance.	Energy and carbon savings and higher visibility of buildings' energy performance
Energy Savings Opportunity Scheme (ESOS)	A mandatory energy assessment and energy savings identification scheme for organisations	Energy and carbon savings after the identification and putting energy efficiency measures in place
Renewable Heat Incentives (RHIs(and Feed-In-Tariffs (FITS)	Financial incentives for implementing renewable technologies	Carbon reduction by using natural energy sources
Part L and Part F Building Regulations	Conservation of fuel and power and air tightness of new buildings, minimum standards of energy efficiency, covers means of ventilation	Maintain a good standard of indoor air quality, Reduced boiler ratings to save fuel cost, Improved thermal comfort and less draughts

Table 5: Key national policy instruments applicable to the public and the HE sector

2.2.4. The public sector policy response

The UK government has developed policies and initiatives (see Table 5) to reduce carbon emissions (HM Government, 2006; DECC, 2011a). The public sector organisations have an important role to implement carbon management policies and are in a central position to set behavioural and strategic example to the private sector (HM Government, 2006). Pryce (2012) argues that the public sector bodies are responsible for up to 23 million tonnes of CO_2 emissions per annum and the associated energy cost is around £5bn. Therefore, scale of the problem and opportunities are huge. By setting high standards of carbon management, the public sector cannot only reduce emissions from its own operations, but influence the procurement and supply chain emissions (HM Government, 2006). The government gives a stronger emphasis to public sector leadership including new requirements on procurement for goods, services and buildings, but there is a lack of mandatory policies in this area (DEFRA, 2006). Pryce (2012) states that the public sector is taking the lead in carbon management nationally, but there is a lag between recognising the opportunity and action. Furthermore, leadership of public sector can encourage citizens to adopt sustainable life style (Birney et al., 2010). Many of the national policies are applicable to the public sector. Most of the UK public organisations accept this imperative and are developing policies and strategies for carbon management with resources and delivery plan. However, in practice, patchy approaches are more common with only some of the building blocks in place (Birney et al., 2010). The public sector organisations face a range of barriers and up-front capital cost is one of them (HM Government, 2006).

In 2004, the Carbon Trust developed a financial vehicle, Salix Finance Ltd, to provide 100% interest-free capital funding for public sector energy efficiency/low carbon projects. Salix funds public sector organisations across England, Scotland, Wales and Northern Ireland. There are two funding programmes available, Salix Energy Efficiency Loans Scheme (SEELS) and Recycling Fund (Salix Finance Ltd, 2014). Many public sector organisations are taking advantage of the Salix funding. There has been no analysis whether the funding has met the savings as stated in business cases. The Carbon Trust secured £20m from the DEFRA in 2005 and this type of financial mechanism drove change by encouraging decision-makers to look at the way; they plan, invest and save (HM Government, 2006). One of the successes of the Carbon Trust was to make energy efficiency a strategic issue for the public sector organisations through its ‘Carbon Management Programme’. The Carbon Trust did this by providing direct information to directors and shareholders, highlighting the compliance and reputational risks associated with not implementing carbon management (Mallaburn and Eyre, 2013). The public sector has undergone significant reforms and budget reductions. Overcoming financial barriers

is important, but they do not exist in isolation. Alongside the development of financial vehicle, the role of strategic advice and support is critical (Mallaburn and Eyre, 2013). The Carbon Trust provided technical and change management support to public sector. Funding was withdrawn from the Carbon Trust and the Energy Saving Trust in 2012. This support does not exist anymore. The government's role was restricted to capacity building and provision of the policy framework (Mallaburn and Eyre, 2013). Post EU referendum, DECC has been abolished and it could be a 'set back' in UK's fight against climate change. Its function is transferred to a new department, Department of Business, Energy and Industrial Strategy (BEIS).

2.2.5. The Higher Education (HE) sector policy response

Before discussing the HE sector policy response to the ever-changing legislative context, it is important to understand the history of sustainability and locate carbon management within the broader context of environmental policy. Sustainability is not a new challenge within HE and came into view during the 1970s and 1980s. The potential of HEIs for contributing to sustainable development is recognised by various international bodies, such as the United Nations (UN), the European Union (EU), government departments and numerous research organisations (Dahle and Neumayer, 2001). The affiliation of HE with sustainability agenda dates back to the United Nations' Conference on the Human Environment (UNCHE) held in Stockholm, Sweden, in 1972. This event was followed by the Belgrade Charter in 1975 and the Tbilisi Declaration in 1977. The UNCHE was the first international conference on HE environmental issues and the concept of 'sustainable development' originated from this conference. These declarations acknowledged the importance of education and HE in moving the sustainability agenda forward (Tilbury, 2011). They formally identified the role of HE in sustainable development at the international level and called for universities to operate ethically and be more accountable to stakeholders with better environmental and carbon management; the training of employees; the redesign of curriculum and contribution to social agendas through research and public engagement (Tilbury, 2010). As a result of the UNCHE, the United Nations Environment Program (UNEP) was found in 1972 and the World Commission on Environment and Development (WCED), the 'Brundtland Commission', was formed in 1987. The mission of WCED was to unite countries for sustainable development (UN, 1987). As part of the global HE sustainability journey, various declarations have been signed by leaders. These declarations were reviewed to set the scene and locate carbon management (see Appendix 7).

2.2.5.1. Policies and strategies developed by the HEFCE

History and role of HEFCE

HEFCE was created following the Further and Higher Education Act in 1992. According to this Act, four funding councils were set up for England, Scotland, Wales and Northern Ireland to

fund UK HEIs and the division between universities and polytechnics was abolished (HEFCE, 2012a). There was a different funding mechanism before 1992. HEFCE distributes public money from the Government to universities and colleges in England (HEFCE, 2012a). HEFCE supports the areas such as Learning & Teaching, Research, Leadership, Governance & Management (LGM), Knowledge exchange & skills, Regulations and Widening participation. "*HEFCE plays a number of important roles in helping to co-ordinate and influence activity across the sector. It has a leadership and brokering role, acts as a conduit of information and, ultimately, as a facilitator of activity"* (HEFCE, 2009a, p.39). HEFCE leads on sustainable development work in the HE sector in England with a primary role to ensure that public money is used to deliver the greatest value to students and the public. This includes monitoring universities to ensure financial health, quality of the courses provided, and that everyone with the potential to enter HE has a fair chance to do so (HEFCE, 2012a). Policies are developed by policy teams working in partnership with sector organisations and the government, informed by expert advice, consultation, and research conducted both in-house and by external partners (HEFCE, 2012b). The focus on carbon management in the UK HE sector started in early 2000s when HEFCE started working on its first sustainable development strategy. HEFCE has played a significant role and has been supporting universities since 2005. There has been a major change in the HEFCE's role as a result of HE reforms. HEFCE is only a lead regulator for HE in England now and is not a main source of capital funding (Department for Business, Innovation and Skills, 2011). HEFCE policies, strategies and guidance are still relevant. However, their impact on future carbon management is unclear due to a shift in the role of HEFCE, as discussed in Section 2.3

Sustainable Development Strategy 2005

In September 2003, the Department for Education and Skills (DfES) launched the 'Sustainable Development Action Plan for Education and Skills' and asked HEFCE to develop its sustainable development strategy (HEFCE, 2008a). HEFCE committed to sustainable development in its first 'sustainable development in higher education' strategy 2005 setting out its strategic goals and vision. This document took account of the UK government's revised strategy for sustainable development, 'Securing the Future' (HEFCE, 2005). 'Sustainable development in higher education' strategy statement and action plan sets out HEFCE's approach to sustainable development following the feedback received on sector wide consultation in 2005. The action plan presents practical actions and is structured around four support roles of HEFCE; engaging with stakeholders, building the capacity of people, sharing good practice and rewarding more sustainable behaviour. At that time, sustainable development was a new responsibility for HEFCE and other funding agencies (HEFCE, 2005). HEFCE defined a ten year vision:

> *"Our vision is that, within the next 10 years, the HE sector in England will be recognised as a major contributor to society's efforts to achieve sustainability - through the skills and knowledge that its graduates learn and put into practice, its research and exchange of knowledge through business, community and public policy engagement, and through its own strategies and operations"* (HEFCE, 2005, p.8).

Strategies and operations were important themes in HEFCE's long-term vision. It sets up the Leadership, Governance and Management Fund (LGM) to provide financial assistance to HEIs in England and support the governors, leaders and managers for good practice (HEFCE, 2012b). The Higher Education Funding Council for Wales (HEFCW), Scottish Funding Council (SFC) and Department for Employment and Learning, Northern Ireland fund HEIs in Scotland, Wales and Northern Ireland respectively. In July 2005, the idea of publishing a 'Strategy and Action Plan' was purely to tackle climate chance and achieve sustainable development in the next ten years (HEFCE, 2005). The Carbon Trust launched its first pilot programme for HE, the 'Higher Education Carbon Management Programme (HECMP)' in 2005. This programme provided HEIs with technical and change management support to realise carbon reduction from areas such as academic, accommodation, leisure, buildings and vehicle fleets. HEFCE (2005, p.29) states that *"through a number of pilot projects, it has identified higher education as a fertile sector for the introduction of carbon management, because of the sector's huge total consumption of energy and its interactions with student".* The Carbon Trust is still working, but operates as a private consultant company. In 2008, HEFCE commissioned a strategic review of sustainable development to measure the baseline of sustainable development activities and provide sector-wide learning from the HEIs experiences (HEFCE, 2008b). HEFCE published an updated 'strategic statement and action plan' in 2008 on sustainable development following feedback through the consultation (HEFCE, 2009b).

Sustainable development in HE: 2008 update to strategic statement and action plan

This is the HEFCE's strategic statement on promoting sustainable development in the English HE sector and its strategic objectives. HEFCE wants to make sustainable development a central part of strategies for the future development of the sector (HEFCE, 2009b). This update document discusses the greater role of universities in terms of their 'brainprint'. It is stated that *"as well as reducing their direct 'carbon footprint', HEIs can use what might be called their 'brainprint' to contribute greatly to the reduction of carbon emissions through knowledge transfer and local leadership"* (HEFCE, 2009b, p.10). HEFCE again discusses four of its support roles and the action plan to meet the roles including engaging with stakeholders, capacity building, sharing good practice and rewarding sustainable behaviour (HEFCE, 2009b). Carbon management is a theme which emerged from this strategy.

Carbon Reduction Target and Strategy for HE in England

In 2008, HEFCE commissioned SQW Consulting and SQW Energy for *"Research into a carbon reduction target and strategy for higher education in England"* to develop a baseline for carbon emissions and set targets for the HE sector in England and to advise HEFCE on its strategy. The baseline was calculated for 1990 and 2006 based on scope 1 and 2 emissions and parts of scope 3 such as waste, water, business travel, commuting, air travel (international students, student exchange programmes and business trips). This research provided universities guidance on calculating baselines, which was a step forward. This report provides 26 recommendations to HEFCE for meeting the sector targets, as set out in the carbon reduction target and strategy. DECC suggested that there are cost effective opportunities to achieve carbon reductions in the HE sector (Bryan et al., 2011). HEFCE and other sector bodies developed infrastructure and guidance programme for universities to effectively implement carbon management, because HEFCE (2005) views the adoption of carbon management as one way of beginning the transition to sustainable development. In 2010, HEFCE published the 'Carbon Reduction Target and Strategy for Higher Education in England'. This strategy commits the sector to help achieve the government's targets as set out in the CCA 2008. The strategy unpacks the role of HE by setting the targets and areas of future work. HEFCE has responded to the government's targets by developing its own carbon reduction targets in England, which are in line with the national targets – 80% reduction by 2050 and 34% by 2020 from the 1990 baseline (HEFCE, 2010b). The targets are for scope 1 and 2 and are on absolute basis against a fixed base year. However, to compensate for the sector's emission growth between 1990 and 2005, a 43% reduction is required from the 2005 baseline by 2020. Scotland has equivalent Universities and Colleges Climate Commitment for Scotland (UCCCFS), which recognises the challenge of climate change.

This strategy expects universities to promote carbon reduction through research, teaching, business operations and public communications (HEFCE, 2010b). It comprises targets, commitment to achieve these targets, support from the sector bodies, funding issues and plans for annual monitoring and reporting. It gives brief guidance on developing individual carbon management plans (CMPs) (HEFCE, 2010b). As part of the strategy, this document presents a systematic approach and a carbon hierarchy giving a step by step guide for carbon management. The steps are 'Reduce, Efficiency, Decarbonise, Befriend, Neutralise and Monitor'. In this document, HE is being encouraged to lead on carbon reduction as it is a significant contributor to carbon emissions, but also because of the privileged position universities hold in being centres of research excellence and in cultivating future 'thought leaders' (HEFCE, 2010b). This was the major strategy document which made universities think about carbon management;

otherwise nothing much was happening in the sector. HE has demonstrated commitment to carbon reduction, and each institution has produced a CMP (HEFCE, 2014b).

Carbon management strategies and plans: A guide to good practice

HEFCE published 'carbon management strategies and plans: A guide to good practice' in 2010 offering comprehensive guidance for carbon management. According to the Capital Investment Framework (CIF), HEIs in England are required to develop individual carbon management targets, strategies and plans. The plans must include a carbon management policy or strategy, calculation of 2005 baseline, targets for scope 1 and 2 emissions with clear responsibility. Plans must be signed off by the governing body of university and there should be commitment to monitor progress for reporting (HEFCE, 2010a). This document explains the process/stages and key elements to develop a carbon management strategy and plan. It also describes methods to measure carbon management performance. However, this document is only for guidance purposes and universities are expected to develop and implement carbon management strategies in different ways, because they have autonomy to develop their own plans reflecting their specific circumstances and business requirements (HEFCE, 2010a). This guide to good practice seems to focus on operational issues around carbon management and neglects strategic and wider organisational issues. This document could be more useful for middle managers in estates instead of other stakeholders in universities such as staff and students.

Capital Investment Framework (CIF)

English universities have been concerned about the policy driver of HEFCE linking the allocation of capital funding with carbon management under its Capital Investment Framework (CIF) (HEFCE, 2008a). Linking capital funding to the environmental performance and carbon reduction has been effective to drive change (HEFCE, 2013a). This was a strong policy driver for universities, but the role of HEFCE has changed from being a HE regulator and funder to be focusing more on how to become a 'champion of the student'. This was a result of the 2010 general election in the UK and subsequent changes in tuition fees. In the last 10 years, HE has been subjected to a huge amount of change, and this change is arguably of most significance as universities are now responsible for setting of fees and receiving their income direct from the students as a result of the Higher Education Bill 2012. The removal of the 'Student Number Control' cap (SNC) whereby universities were limited to how many home and EU students they could recruit – in 2015 has arguably led to a more market driven approach to recruitment. For universities and sustainability, the link between capital funding and carbon management was abolished. Robinson et al. (2015, p.114) observe; *"now there is no 'stick' that will drive HEIs towards reduction and so the 'carrot' (financial savings etc.) must be prioritised. Once aware of this, the delivery of targets will most certainly become a lower priority business activity for*

senior personnel". What is of note for this research is that these policy changes have happened during the course of this research. To that end, these changes may impact future carbon management performance of universities in future.

Revolving Green Fund (RGF)

HEFCE has been funding universities to invest in carbon management and over £60 million has been made available in partnership with Salix Finance over the three rounds of the Revolving Green Fund (RGF). These are recoverable grants for the projects that reduce emissions and costs (HEFCE, 2013a). RGF is targeted in two areas, small-scale energy efficiency programmes and large-scale projects. Large projects include new technologies, retrofitting and space rationalisation (HEFCE, 2014a). This fund has finished its fourth round (RGF4), which was the largest round providing up to £34 million in recoverable grants. The third round of the fund (RGF3) allocated £21 million to 43 universities, funding 37 small-scale programmes and 10 large projects representing 2.5% of the 2020 carbon reduction target. In second round (RGF2), £10.8 million was allocated to 27 HEIs including four large projects. The first round invested £30 million (£20 million from HEFCE and £10 million from Salix) having two strands, one for institutional small projects and 'transformational' fund for large exemplary projects (HEFCE, 2014a). Blue Alumni, a management consultancy, conducted an evaluation of 1 to 3 rounds of RGF and reported that English HEIs reduced CO_2 emissions by 104,623 tonnes or just fewer than 12% of the sector's 2020 target between 2005 and 2012. RGF projects aim to deliver annual savings of nearly £19 million on their full operation across all funding rounds. *"HEIs applying to or receiving RGF funding have reduced emissions by 7% to 10% more than other HEIs, depending on the measure"* (Blue Alumni, 2014, p.3). This evaluation shows that the fund is meeting its aim by providing a mechanism to invest, which would have not occurred otherwise. The fund is limited and HEFCE and Salix should continue to review and increase it with the help of co-funders (HEFCE, 2010b). HEFCE can also simplify the grant application process. HEFCE supported the sector with its other direct funding options of the Higher Education Innovation Fund and the Catalyst Fund (HEFCE, 2014a).

Focus on scope 3 carbon management

HEFCE recognised the importance of scope 3 emissions, which are procurement, waste, water, travel and commuting emissions arising from the organisation's activities. In order to improve understanding of scope 3 carbon management, HEFCE commissioned a guidance on their measurement (HEFCE, 2013a), but institutions could not calculate their scope 3 emissions within the time frame given (HEFCE, 2010b). HEFCE made a commitment and gave a deadline to universities to measure their scope 3 related carbon emissions by December, 2012 and integrate them in their CMPs by December, 2013, but institutions could not meet this time-

frame of calculating scope 3 emissions (HEFCE, 2010b). This deadline was missed by many universities due to data management issues. HEFCE is working in partnership with sector bodies including Universities UK (UUK) and GuildHE to make progress in areas such as procurement and Information & Communications Technologies (ICT) (HEFCE, 2013a). Procurement is considered as one of the most difficult areas among scope 3 emissions to measure (HEFCE, 2010a). Out of scope 3 carbon emissions sources; there has been more focus on procurement in HEFCE strategy. This could be because procurement related emissions are possibly half of the HE sector's total emissions. This makes it an area where significant carbon reductions can be possible (HEFCE, 2010b). Currently, there is no mandatory policy framework for scope 3 including procurement. The Scope 3 Guidance Reports provide guideline to calculate scope 3 emissions. It aims to help universities adopt efficient and effective data collection practices, but the progress is slow. From 2012, Estates Management Record (EMR) published by the Higher Education Statistics Agency (HESA) contains provision for comprehensive collection of scope 3 emissions. HESA collects environmental information from the UK HEIs as part of the EMR annually and it is publicly available against different parameters (HESA, 2014b). HEFCE provided information, benchmarking and guidance in a number of areas, which have direct or indirect impact on carbon management. HEFCE is supporting the Leadership Foundation for Higher Education (LFHE) for embedding sustainability in its activities and engaging with the Committee of University Chairs (CUC) to promote sustainability as a core principle in management and governance.

Sustainable Development Framework

In November 2013, HEFCE launched a consultation on its sustainable development framework. This framework sets out ways the English HE sector can contribute to implement sustainable development and presents a framework for how HEFCE is planning to support sustainable development and carbon management. This document encompasses its earlier policy statements. The role of students, Education for Sustainable Development (ESD) and research is largely recognised in this framework. This was not the case in previous strategy documents. This framework addresses academic and support staff, students and senior managers, whereas, in most of the previous documents, the audience was senior management, estates and finance departments. This time HEFCE asked for students' views during this consultation and the framework recognised the shift in the role of students. University management and leadership emerged as key themes in the framework and HEFCE plans to help universities to reduce their environmental impact (HEFCE, 2013a). The final sustainable development framework was published in December 2014. The consultation concluded with a framework for sustainable development to guide HEFCE and identify key priority areas during 2015-2020. The framework

also encompasses earlier policy statements on sustainable development and carbon reduction. HEFCE (2014b) states that the overall target for the HE sector is challenging. Furthermore, 2011 emissions data indicated that the collective impact of institutional targets would lead to a 38% reduction between 2005 and 2020 and there is about 5% short of the sector target. Some universities have reported continuous progress, whereas others are facing challenges. HEFCE has plans to revisit the sector performance against this target to assess whether the 5% gap has been fulfilled and, if not, what can be done to achieve this. HEFCE (2014b) proposed to explore the possibility of establishing a 'Carbon Information Service' to provide support and advice, including on measuring and reporting emissions and translating policies into actions. This framework indicates that HEFCE plans to restore support service which the Carbon Trust was doing, but it is unlikely to happen due to change in the role of HEFCE.

National Union of Students (NUS) Students' Green Fund

NUS "Students' Green Fund" provides students' unions with financial aid to develop transformative, student-led sustainability projects with real impact and legacy. The fund consists of £5 million of funding provided by HEFCE to help 25 students' unions in England to develop ambitious projects for embedding pro-environmental behaviour in universities. 'Student engagement' is at the heart of these projects. It is estimated that over its first two years, Students' Green Fund is engaging over 50,000 students, improving institutions' position in the People & Planet's UL by implementing projects.

Table 6 describes the key HEFCE policies and strategies from 2005 to 2014 with the emergent themes. The documents in 'bold' are the ones from where themes emerged and they are presented in the next column. The other documents are not relevant to generate themes, as they only discuss funding and scope 3 measurement issues. The majority of the themes overlap in HEFCE strategies and documents. There has been no carbon management activity by HEFCE since the launch of the Sustainable Development Framework in 2014. This was HEFCE's last publication due to changes in the HE sector, i.e. HEFCE not being a source of capital funding. This indicates that the future role of HEFCE in carbon management is uncertain.

Year	Name of HEFCE policy and strategy	Themes emerged
2005	• **Sustainable development in higher education**	-Policy, Leadership, Governance, Decision-making, Benchmarking, Engagement, Reporting, Stakeholders' engagement, Responsibility, Funding
2009	• **Sustainable development in higher education: 2008 update to strategic statement and action plan** • **Research into a carbon reduction target and strategy for higher education in England**	-Community engagement, leadership, Funding, Stakeholders engagement, Policy, Governance, Space management, Communication. Whole-institution approach, Reporting - Carbon measurement, Targets, Boundaries of

	• **Consultation on a carbon reduction target and strategy for higher education in England**	carbon emissions, Baseline, Behaviour change, Engagement, Management, Governance, Partnerships, Senior management buy-in, Communications - Carbon measurement, Baseline, Targets, Funding, Governance, Space management, Partnerships, Students' engagement, Monitoring and reporting
2010	• **Carbon reduction target and strategy for higher education in England** • **Carbon management strategies and plans: A guide to good practice** • Launch of the second Capital Investment Framework (CIF2) linking environmental performance of institutions to capital allocations. • HEFCE's financial memorandum requires institutions to have Carbon Management Plans (CMPs)	-Policy, targets, Responsibility, Monitoring and reporting, Governance, Stakeholder engagement, Resources, Communications, Partnership, Senior management buy-in, Space management, Behaviour change, Carbon offsetting -Baseline, Targets, Monitoring and reporting, Stakeholders' engagement, Communication, Space management, Behavioural change, Communications, Partnership, Governance, Funding, Carbon offsetting
2012	• Publication of the guidance of 'Measuring Scope 3 carbon emissions – Supply chain (procurement), Transport, Waste and Water • Estates Management Record published by the HESA contains provision for comprehensive collection of scope 3 emissions • Revolving Green Fund (RGF) – invitation to apply for a third phase of funding, £21 million	
2013	• Award of £5 million for the National Union of Students (NUS) Students' Green Fund • **Sustainable development in higher education: Consultation on a framework for HEFCE**	- ESD, Research, Engagement, Governance, Business planning, Policy, Collaboration, Responsibility, Funding, Benchmarking
2014	• Revolving Green Fund (RGF) – invitation to apply for fourth phase of funding, £34 million • **Sustainable development in higher education: HEFCE's role to date and a framework for its future actions**	-Student engagement, ESD, Leadership, Resources, Whole-institutional change, Behaviour change, Targets, Funding, Policy, Benchmarking

Table 6: HEFCE policies and strategies with emergent themes

2.2.6. Non-statutory/optional schemes in the HE sector

Not-for-profit organisations such as the Environmental Association of Universities and Colleges (EAUC) and the Association of Directors of Estates (AUDE) are playing a role in the drive towards low carbon HE by sharing information and best practices. The UK HE sector has distinguished itself by introducing benchmarking schemes such as the People and Planet Green League, now called University League (UL), which ranks universities according to their environmental performance. Carbon management is one of its indicators. It is a comprehensive and independent league table which awards degree-style classifications to universities. It is

compiled annually by the UK's largest student campaigning network, People and Planet (People and Planet, 2014a). Since its first publication, the UL has faced criticism from HE stakeholders. The league table is facing accusations of unfairness and it is argued that it 'compares apples & pears' and is not sophisticated enough to account for the diversity of universities within the sector (People and Planet, 2012). It is still a non-statutory driver for carbon management.

The 'Student Switch Off' is an energy-saving competition between halls of residence in UK universities (HEFCE, 2009a). The scheme is expanding, but it neglects a large population of students who live in private accommodation. The Green Gown Awards (GGAs) scheme recognises exceptional projects being implemented by universities and colleges. The Awards have become established as the most prestigious recognition of best practices in HE and beyond (EAUC, 2014b). EAUC runs the projects, named as Sustainability Exchange and Learning in Future Environments (LiFE) to embed sustainability in HE. The Sustainability Exchange is an online community to share best practices, resources and knowledge. LiFE is a strategic planning and self-assessment tool for tertiary education sector to improve environmental performance. HEFCE funded the design of the Building Research Establishment Environmental Assessment Method (BREEAM) template specific to HE with the cooperation of the AUDE and other funding councils. It is for both new build and refurbishment projects and provides a high-quality and rigorous set of criteria for the environmental assessment of university buildings (HEFCE, 2010b). In 2005, HEFCE launched the Environmental Management System (EMS) and award scheme 'EcoCampus' specifically for HE. This project was funded by HEFCE from its Leadership, Governance and Management (LGM) Fund. It is a support package for implementing EMS in universities and conforms to the requirements of the International Standard ISO 14001 (EcoCampus, 2013). EcoCampus and ISO 140001 can drive carbon management. The Carbon Trust designed the Carbon Trust Standard for public sector organisations including universities.

2.3. A changing HE sector: Do students want sustainability in universities?

Since the change in funding regime in the HE sector, universities seem to be operating as business organisations in a very competitive market and students are customers, as they are the main source of income, not HEFCE anymore. The cap on the number of university admissions is also lifted from 2015/16. Therefore, universities are changing the way they prioritise activities: from carbon management to student experience and employability. In the absence of HEFCE and national driver, universities may not prioritise carbon management as they used to do in the past. *"Some institutions indicate that finding the resources to move further towards*

sustainable development is more difficult in the current financial climate, and that they would like to see clearer leadership from the government" (HEFCE, 2013b, p. 50). However, a series of surveys, commissioned by the Higher Education Academy (HEA) and conducted by the National Union of Students (NUS) found that around 85% of first-year students believe that universities need to actively promote sustainable development and over 60% want to learn more about sustainability (Drayson et al., 2012). HEFCE (2014) argues that students are better informed than before about the potential risks to the natural environment and the need to mitigate these potential risks through carbon management.

Many students care about the environment and have views in favour of sustainable development. NUS is leading a staff and student engagement programme called the 'Green Impact', which is an environmental accreditation scheme. In that case, universities may take 'carbon' seriously in line with student experience and employability related issues. There has been a range of innovative environmental and behavioural change programmes aimed at students, such as Sound Environmental Impact Awards, Degrees Cooler and Carbon Academy. HEFCE (2009b) recognises that students are a valuable partner to bring change and HEFCE aims to work with student organisations such as NUS and NUS Services Ltd to promote behavioural change and engagement among students population. Overall, there is a wide range of support activities in the sector, both through programmes at a wider sector level and also driven from within individual universities (HEFCE, 2009a). Table 7 presents carbon reduction activities in HE with some examples. These activities distinguish the position of HE.

Carbon reduction support	Examples
Institutions/organisations	Carbon Trust, Higher Education Environmental Performance Improvement (HEEPI), EAUC, Forum for the Future, People & Planet
Programmes	Higher Education Carbon Management (HECM) Programme, Green Gown Awards, University League, Eco-campus
Funding streams	Revolving Green Fund
Guidance documents/best practice	HEEPI research, HECM toolkit, WARP toolkits

Table 7: Examples of sector-wide carbon reduction activities (HEFCE, 2009a)

There is good practice in HE, but HEFCE is keen that the English universities continue to develop new ideas for carbon management and learn from the experiences of each other (HEFCE, 2009b). "*HEFCE and HEIs are making genuine efforts to promote sustainable development and to develop good practice and tools"* (HEFCE, 2005, p.8). In its grant letter of 2013 to HEFCE, the UK government recognised the good progress of sustainable development in the HE sector (HEFCE, 2013a). HEFCE believes that their own organisation should lead by example and aims to improve environmental performance of its operations (HEFCE, 2014b).

2.4. Discussion and conclusions

This chapter has reviewed the global, EU and UK policy landscape around climate change and carbon management. It discussed policy implications for the public sector and focused on the HE policies mainly introduced by HEFCE. The chapter has discussed key national policy instruments which both public and the HE sector have to comply with. What is clear throughout is the impact of the pace of the change, both around climate policy in general and for HE more specifically. The overall climate change and carbon management policy framework is complex, encompassing a range of different instruments and measures. There is a need to implement these policies effectively and deliver carbon reductions. The official documents of the government are subjective because they reflect the government's position on carbon management. There are only few academic papers focusing on policy implementation in the UK (Mallaburn and Eye, 2013). The global and the European policies have infiltrated the UK and devolved administrations' policies. The UK government has developed a range of policy measures to reduce emissions since the late 1980s, but the policies have been continuously changing causing problems for practitioners. The idea that universities must take special responsibility in promoting sustainability is new and was almost unknown till 1990s (Corcoran and Wals, 2004). The first decade of 2000 was a turning point for carbon management in the UK and policies were more explicitly driven by greenhouse gas reductions (Eyre, 2001). Since then, there has been lot of policy and regulatory changes where policy tools were scrapped and changed and it may be a 'compliance burden'. The implementation of the Kyoto Protocol in 2005, evidence from the Stern Review Report in 2006, the IPCC Fourth Assessment report in 2007 and the UK Climate Change Act in 2008 brought the issue of 'carbon management' to the political and public agenda.

The national and HE policies and targets are focused on energy related scope 1 and 2 emissions and do not include mandatory targets for indirect scope 3 emissions. One of the lessons learnt from the last two decades is that governments have been slow to recognise the magnitude of the challenge and respond to it (Quality of Life Policy Group, 2007). Despite having the CCA 2008, a diverse and pro-active set of policies is required. This is possible with limited economic difficulties, by adopting cost-effective energy efficiency measures (Eyre, 2001). This could help in carbon management in various sectors. The situation is more uncertain after the abolition of DECC and government's leadership on climate change seems to be lacking. Technical solutions for limiting CO_2 emissions exist globally, but the type of climate change policies that are feasible, the extent of their effective implementation and their likely impacts vary widely (Grubb et al., 1991). Policy has not focused much on human factor and this could provide a

future opportunity for policymakers. Still, the UK is leading the world in its low carbon policy model. There is evidence that the public sector is leading the way, not only nationally, but internationally in carbon management (Rugg, 2013). Over the past few years, the carbon management agenda has emerged and grown dramatically in response to the policy landscape. However, most of the policies act as sticks for public bodies such as universities. There is a lack of balance between 'carrots and sticks', but policies raised the profile, visibility and strategic importance of carbon management over the last few years. There was not much happening before the policies and this is similar to what Robinson et al (2015) reported. The Energy Saving Trust and the Carbon Trust delivery models are adopted around the world (Mallaburn and Eyre, 2013). The UK has developed ambitious targets and it needs to adopt measures to meet the stringent carbon budgets and targets. The main question is 'has any of this worked?'. Mallaburn (2008) states that it has only worked for larger organisations and the progress is not as clear as it should be in smaller businesses and the public sector. In contrast, Willis (2006) argues that current policy levers are not working well, as they could motivate and encourage organisations to play their role. The implementation rate is low. Both policy and delivery are getting complex and focused on outcomes. However, HE is working towards national policies.

Through mapping the international declarations and frameworks, universities seem to be committed to transform HE sector towards sustainability, but achievements are mostly disconnected from the core business of HE (Tilbury, 2011). Overall, HE is making substantial progress in carbon reduction and becoming more sustainable via mitigating the climate change (HEFCE, 2013a). The majority of environmental schemes and activities are voluntarily introduced by various groups and not-for-profit organisations. Some institutions are responding to these schemes and initiatives whilst others are not. The sector has been acting on carbon emissions over the last few years (James and Hopkinson, 2011). HEFCE played an important role in HE carbon management. In addition to various strategies, HEFCE provided universities with a comprehensive guidance and policy framework for carbon management, but, they do not inform barriers to change. Universities can clearly understand 'what to do', but there is little focus on 'how to do'. The sector has policies, strategies and plans, what the sector really needs now is delivery (HEFCE, 2013a). There seems to be a lack of effective policy implementation, which individual institutions could address. HEFCE (2009b) argues that these issues should be considered by individual universities. It is beyond the role of HEFCE to provide definitive solutions. The role of HEFCE has weakened after the change in the sector and its future seems to be uncertain. There is no strong policy driver in the sector anymore and the rise of student as consumers may change the way universities prioritise business activities to recruit students. This

changing dynamics may have detrimental effect on carbon management and at present, the future of HE carbon management is uncertain due to a lack of strong driver. Despite this, HEFCE could act as a policy role model for global HE sectors and address policy needs, but its future is on stake. There has been debate and criticism on government policies and their effectiveness, particularly in the national context. Porritt (2011) argues that the government's apparent lack of visibility and vision has not helped the low carbon agenda. The UK may still provide learning for public sector and beyond based on its experience. The government remains committed to the CCA 2008 and carbon budgets (Froggatt et al., 2016). Table 8 presents the key findings from objective one with themes and/or CSFs.

No	Objectives	Key research findings	Themes/CSFs
1	To analyse the global, EU and UK policy landscape around climate change and carbon management and its implications for the UK HE sector.	• Climate change and carbon management policy framework is complex encompassing a wide range of policy instruments and measures to be implemented and there is uncertainty in the UK policy landscape. Due to continuous policy changes and uncertainties, the government's commitment to carbon management is questionable. (Section 2.2.3 and 2.2.4) • The national and the HE sector policies are focused on energy related direct and indirect (scope 1 and 2) carbon emissions and do not include policies and targets for indirect scope 3 emissions. Policy instruments are not focused on human factors and appear to encourage technical solutions only. There is also very limited advice and support for implementation. (Section 2.2.3, 2.2.4 and 2.2.5) • HEFCE has played an important role in carbon management and its strategies have provided universities with guidance to implement it. However, HEFCE does not help address specific barriers to change and the focus is more on 'what to do' rather than 'how to do'. HEFCE can act as a role model to encourage other HE sectors nationally and globally to address policy needs with exemplar programmes and policies. On the other hand, the impact of policies is not measured and the question if any of these have worked is still unanswered. Recent changes in HE have weakened the role of HEFCE and the future is uncertain. Carbon management seems to take a 'pause' and there is a lack of strong drivers. (Section 2.2.5)	Climate change, Policy, Indirect emissions, Strategies and plans, Leadership, Funding, Students

Table 8: Findings from objective one

Chapter 3: Research issues and theoretical background

3.1. Introduction

This chapter provides a critical review and evaluation of the literature around strategic carbon management (SCM) and organisations. It provides a theoretical background for an in depth study of SCM in the Higher Education (HE) sector. It starts with a brief overview of climate change as a strategic business issue and it covers the topics of carbon management in business organisations and then in public and HE sector organisations. Theoretical background and understanding is developed through the systematic review of the literature as they provide the foundation for the proposed research question by identifying gaps in the existing knowledge. In this chapter, both academic and non-academic literature is reviewed surrounding this topic. However, general strategy and strategic management literature is not in the scope of this study and is not reviewed, as mentioned in Section 1.2 in Chapter 1.

3.2. Climate Change: A strategic business issue

The policy and strategy debate on the issue of global climate change is changed significantly (Kolk and Pinkse, 2005). There is consensus across the globe that climate change is a serious threat, but there are some sceptics who do not believe in it and challenge the scientific evidence (Wittneben and Kiyar, 2009). The question is no longer whether climate change is happening, but how it will affect business organisations globally. Schultz and Williamson (2005) state that business organisations in Europe can be exposed to climate change in three different ways: firstly, governments are putting limits on organisations' GHG emissions; secondly, climate change will directly impact organisations and thirdly, public perceptions of organisations' behaviour towards climate change may impact their viability. Business organisations are part of society and they now face a challenge of not only reducing carbon emissions to mitigate climate change, but also understanding how it will impact their operations (Okereke, 2007). Corporate carbon strategies are considered as the possible source of gaining competitive advantage. Carbon has become a strategic part of the new competitive advantage for organisations, just like capital, human resources and products (Schultz and Williamson, 2005). Management studies claim that there is a business case for organisations to implement effective carbon management strategies for climate change mitigation. Thus, climate change is developed as a business issue and companies are able to increase their competitive advantages by implementing carbon reduction strategies (Busch and Wolfensberger, 2011). Businesses are not only under pressure from government policies, consumers and other competitors in the market to reduce their emissions, but also they need to consider it as a cost to the climate system (Wittneben and Kiyar, 2009). Some argue that climate change is not an environmental issue, but it is a market issue for business organisations and there are various strategic options to address market components of climate change (Hoffman and Woody, 2008). In contrast, many organisations may think climate change is a Corporate Social Responsibility (CSR) issue and business leaders need to approach this in the same

way as any other risk or potential business opportunity (Porter et al., 2007). "O*rganisations should integrate climate change into their strategic management process by carefully considering market activities as well as non-market and political responses"* (Kolk and Pinkse, 2005, p.12).

Therefore, incorporating climate change into business operations through carbon management strategies is becoming crucial in the current business environment. It is due to increasing level of understanding among various stakeholders (Hoffman, 2007). Companies see carbon management more of a business opportunity as opposed to risk management (Jackson, 2008). Subramaniam et al. (2015) suggest integration of carbon emissions related risks and opportunities in risk management system, but it remains unclear and insufficient. The framing of climate change as a 'strategic' issue motivates business organisations to develop effective climate strategies. It could give competitive advantage to the organisations, but failure to act may cost them loss in market value or share (Okereke, 2007). Carbon has cost implications for business organisations and Figure 5 shows the costs of carbon in terms of organisational factors.

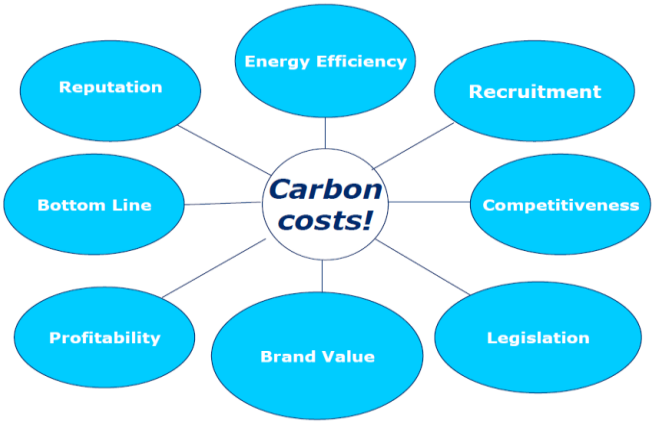

Figure 5: How does carbon cost? (Horgan, 2011)

3.3. What is a carbon footprint?

'Carbon footprint' has emerged as a widely used term over the last few years in the public domain as part of abatement actions against climate change and GHG emissions. A transparent understanding of carbon footprint is essential as a prerequisite for any organisation regardless of its boundary (Burtis and Watt, 2008). Defining a carbon footprint is difficult for organisations because people still do not know what to include in it (Czerniawska, 2007). It is now a buzzword widely used across the media, governmental bodies and in the business world (Wiedmann and Minx, 2008). Wiedmann and Minx (2008) carried out a literature search and found that despite of all the facts, there exists apparent discrepancy between public and academic use of the term 'carbon footprint'. Different people and organisations have defined this term in different ways which makes it unclear in the existing literature. It is unclear what does carbon footprint actually mean?. This offers a challenge to achieve a consistent and correct methodology where organisational performance can be compared (Wright et

al., 2011). In most cases, the term 'carbon footprint' is used as a synonym for carbon dioxide (CO_2) emissions (also called carbon) or greenhouse gas emissions, expressed in CO_2 equivalent.

> *"A carbon footprint is the total greenhouse gas (GHG) emissions caused directly and indirectly by an individual, organisation, event or product, and is expressed as a carbon dioxide equivalent (CO_2e)"* (The Carbon Trust, 2012c, p. 2)

> *"The carbon footprint is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product"* (Wiedmann and Minx, 2008, p.4)

Carbon footprint accounts for six Kyoto greenhouse gases, known as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6) (UNFCCC, 2013). There are four steps for calculating carbon footprint of an organisation. First, identification of different sources of carbon emissions, such as combustion, process and fugitive emissions sources. Second, defining the boundaries of different sources of emissions including direct and indirect. Third, collect the data and determine the related carbon emission coefficients. Fourth, based on the main business and fund size, organisations select suitable approaches to calculate carbon footprint (Wang et al., 2012). Carbon footprint evaluation process can be seen in Figure 6.

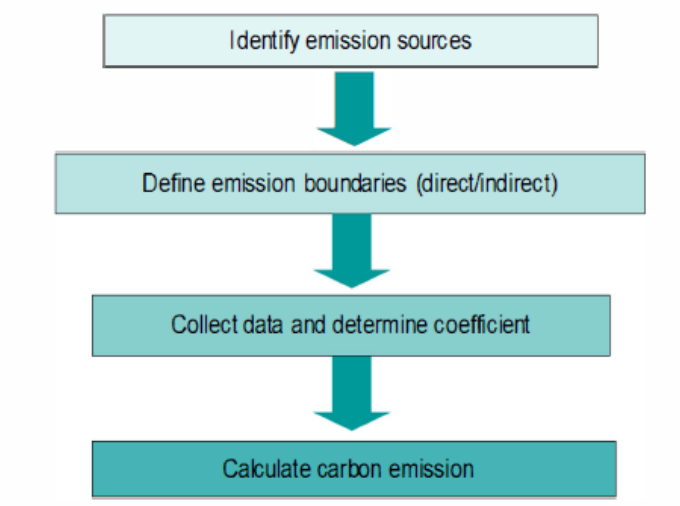

Figure 6: Evaluation process of carbon footprint (Wang et al., 2012)

3.4. Carbon management in organisations

During the last decade, the need to reduce carbon emissions has become one of the most pressing environmental concerns and it is a fast moving international phenomenon (Roosa and Jhaveri, 2009). The emerging issue of carbon management has been addressed using various terms, such as environmental management, sustainable development, eco-innovation, eco-efficiency and eco-industrial development. Furthermore, researchers suggest various practical approaches to address the challenge of carbon emissions (Kang, 2011). As the threat of climate change and carbon emissions becomes more important, so does the need for adequate measures of their proactive management. A

large number of organisations are engaged in reducing carbon emissions, as their management think that this is the right way to run an organisation in the 21st century. Senior management values carbon management in order to make the organisation well-managed. Furthermore, carbon management makes good business sense (Busch and Shrivastava, 2011) and organisations in various industries have started taking steps for carbon reduction and management (Wang et al., 2012).

In contrast, Boiral (2006) state that many business organisations aim to maintain the status quo and do not address carbon emissions unless they are obliged to do so. Due to increase in carbon emissions and associated costs in the future, organisations may concentrate more time and efforts reducing their dependence on fossil fuels and reduce emissions (Czerniawska, 2007). The focus has now shifted from "why is climate change a strategic business issue?" to "how can organisations generate business value from reducing carbon emissions of operations, supply chain, and products?". Therefore, carbon management is expected to become mainstream in future in many of the organisations (Noble, 2013). It now appears almost compulsory for corporations to adopt some form of a greenhouse gas reduction strategy as part of their core business strategy. Nearly all of the Financial Times Stock Exchange (FTSE) 100 companies reporting on climate change have made some link between profit and carbon management (Okereke, 2007). In recent years, the climate change and carbon management debate has dramatically risen up the public agenda, but carbon management in the context of built environment remains the least well-studied subject (Emmanuel and Baker, 2012). The emphasis in the past has been more on the science involved, and communicating the extent humans are affecting the global environment; this is now widely accepted that humans have an impact on the natural environment (Kolk and Hoffmann, 2007). Over the last few years, studies on organisational carbon management have emerged and provided insights. Organisations have started tailoring carbon management strategies to reduce carbon emissions (Cadez and Czerny, 2012).

Liu (2012) described carbon management as a corporate effort to reduce the carbon impact of organisation's business activities to address climate change. Not all GHG emissions are directly related to carbon, but these are included in the definition of carbon management in terms of carbon dioxide equivalents (CO_2e). Carbon management aims to understand how value is created within organisations and to assess the carbon-related strategic, operational and project risks to that value creation (Challis, 2008). The established measures of carbon management are focused on specific areas such as GHG emissions reductions, development of low-carbon technologies, producing clean energy and the reorganising of economic structures. Furthermore, organisational structures and business models have contributed to the progress of carbon management, but step changes are still needed (Liu, 2012). The research was carried out on fossil fuel-intensive industries in China and Liu (2012) found that the firms were relatively well informed about the value of carbon management and were willing to implement it. However, there was no evidence of the actual behaviour by these

organisations to implement carbon management: therefore a gap exists between carbon management understanding and awareness and behaviour and implementation.

3.4.1. Carbon management principles and hierarchy

Carbon management is relatively a new concept for organisations, effective strategies are required to integrate carbon management into operations (Wahyuni and Ratnatunga, 2015). Organisations want to learn from the experiences of others and a framework approach is essential, which could serve as a guide to help other organisations beyond their own boundaries and help strategically manage carbon emissions. A framework of carbon management principles was developed and it intends to assist businesses in effective decision-making to reduce GHG emissions. This framework should be applied on a case-by-case basis for opportunities to reduce emissions and increase business value (Environmental Protection Agency, 2007). The Environmental Protection Agency's (EPA) framework explains that organisations should first measure carbon emissions and then set objectives to reduce them. Organisations should avoid generating emissions as much as they can in their carbon management journey. This framework also offers carbon sequestration and offsetting the residual amount of emissions. If energy consumption is minimised and alternative energy is maximised and organisations are looking for further emissions reductions, carbon offsetting is the next opportunity. *"A carbon offset is an investment in a project aimed at reducing or preventing carbon emissions or sequestering carbon from the atmosphere*" (Earth Check, 2013, p.4). Carbon offsets involve purchasing 'carbon credits' to offset emissions of any organisation. According to Williamson (2012), carbon offsetting is often adopted by organisations for mobile sources of emissions such as travel and transport. It is not considered as a cure for climate change, but the effective way to address climate change is to reduce emissions (DECC, 2011b). However, this could be used as one of the last options (Spirovski et al., 2012). Figure 7 indicates the principles of carbon management.

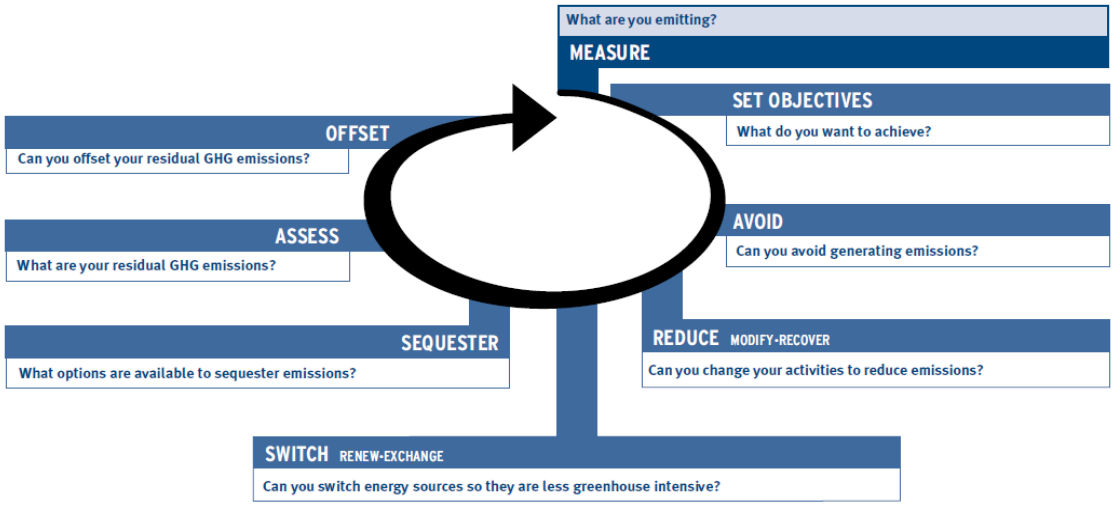

Figure 7: Carbon management principles (Environmental Protection Agency, 2007)

Burtis and Watt (2008) developed a hierarchy for carbon management to inform corporate climate strategy more broadly rather than carbon neutrality only. This hierarchy prompts organisations to consider actions that will have transformative and long term impact on carbon emissions. It is accepted as a 'best practice' approach (Andrews et al., 2015). The hierarchy of key actions is in the following sequence:

- **Avoid:** avoidance of carbon emissions for first instance
- **Reduce:** carbon emissions reductions through energy efficiency
- **Replace:** replacement of high carbon energy sources with low/zero-carbon options
- **Offset:** offsetting left over carbon emissions

Carbon offsetting is at the bottom of the hierarchy as it does not directly reduce an organisation's carbon emissions, but it is currently impossible for any organisation to become carbon neutral without embracing offsetting. Burtis and Watt (2008) believe that high-quality offsets result in genuine emissions reductions and recognize that this phenomenon will play an important role in achieving carbon neutrality. In contrast, carbon offsetting is a cheaper way of carbon reductions. This economic argument is probably the strongest justification of carbon offsetting as part of carbon management strategy (Burtis and Watt, 2008). Figure 8 presents the main steps of the hierarchy. Actions at the top of the hierarchy are more effective for carbon management of any organisation.

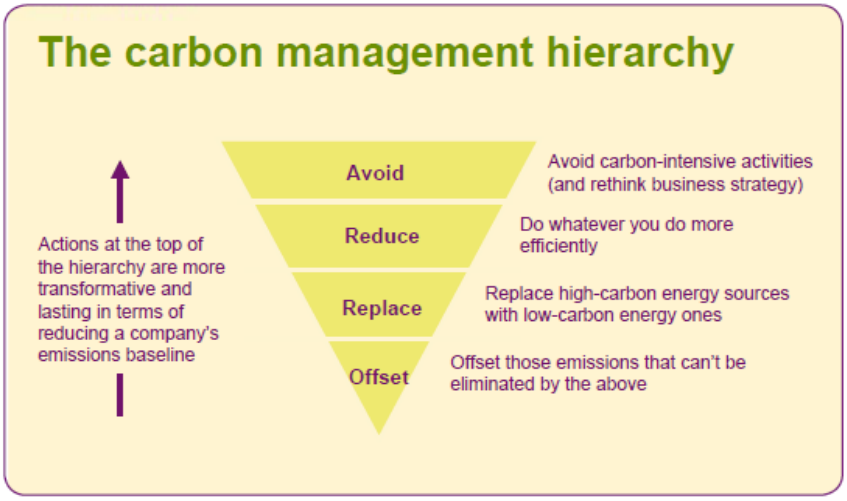

Figure 8: Carbon management hierarchy (Burtis and Watt, 2008)

This suggests that carbon management is a hierarchical process. Horgan (2011) also produced a hierarchy of carbon management (Figure 9) in four steps. The first step is to minimise the waste of energy with the help of controls and user's awareness, second step is the installation of energy efficient technologies, third step is to install onsite renewable technologies and fourth step is offsetting the remaining emissions. However, renewable energy is not installed extensively due to longer payback period and the initiatives with shorter payback are preferred (Dahle and Neumayer, 2001).

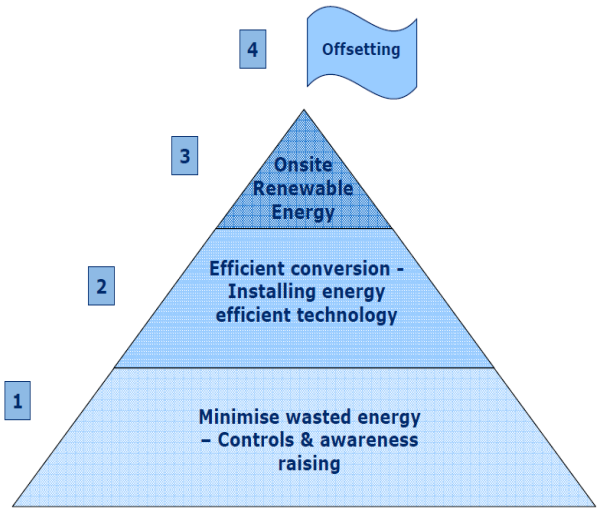

Figure 9: Carbon management hierarchy (Horgan, 2011)

3.4.2. State of carbon management research

Wang et al. (2012) carried out a comprehensive review of the published literature on carbon management, evidenced from the lSI Web of Knowledge and found more than nine hundred publications. Their research was focused on the perspective of logistics industry. Figure 10 shows the topic of carbon management researched in different subject areas. The researchers from environmental sciences and ecology contributed most of the publications on this topic, about 55% of the publications. The subject area of Business and Economics in under-researched and its contribution in the field is only 8.9%. The literature review in this study finds carbon reduction strategies in energy intensive industries mainly focussing on plant efficiency, fuel & energy saving, production process and low carbon technologies. There is also literature on carbon related issues in the context of forests and soils, but there is a lack of literature on carbon emissions reduction in organisational context. In Figure 10, organisational research on carbon management does not exist. Figure 11 shows the increasing frequency of publications from 1995 to 2009 on the topic of carbon management in different subject areas. The majority of the papers were published in 2007-2009.

Field: Subject Area	Record Count	% of 929	Bar Chart
ENVIRONMENTAL SCIENCES & ECOLOGY	511	55.0054 %	
AGRICULTURE	419	45.1023 %	
METEOROLOGY & ATMOSPHERIC SCIENCES	261	28.0947 %	
PLANT SCIENCES	211	22.7126 %	
ENGINEERING	169	18.1916 %	
CHEMISTRY	148	15.9311 %	
BIODIVERSITY & CONSERVATION	135	14.5318 %	
PUBLIC, ENVIRONMENTAL & OCCUPATIONAL HEALTH	134	14.4241 %	
FORESTRY	115	12.3789 %	
ENERGY & FUELS	108	11.6254 %	
BUSINESS & ECONOMICS	83	8.9343 %	
MATHEMATICS	77	8.2885 %	
SCIENCE & TECHNOLOGY - OTHER TOPICS	77	8.2885 %	
BIOCHEMISTRY & MOLECULAR BIOLOGY	71	7.6426 %	
TOXICOLOGY	69	7.4273 %	
WATER RESOURCES	64	6.8891 %	
INSTRUMENTS & INSTRUMENTATION	55	5.9203 %	
COMPUTER SCIENCE	48	5.1668 %	
GEOLOGY	41	4.4133 %	
TRANSPORTATION	28	3.0140 %	
MATHEMATICAL & COMPUTATIONAL BIOLOGY	26	2.7987 %	

Figure 10: Carbon emissions management research in different subject areas (Wang et al., 2012)

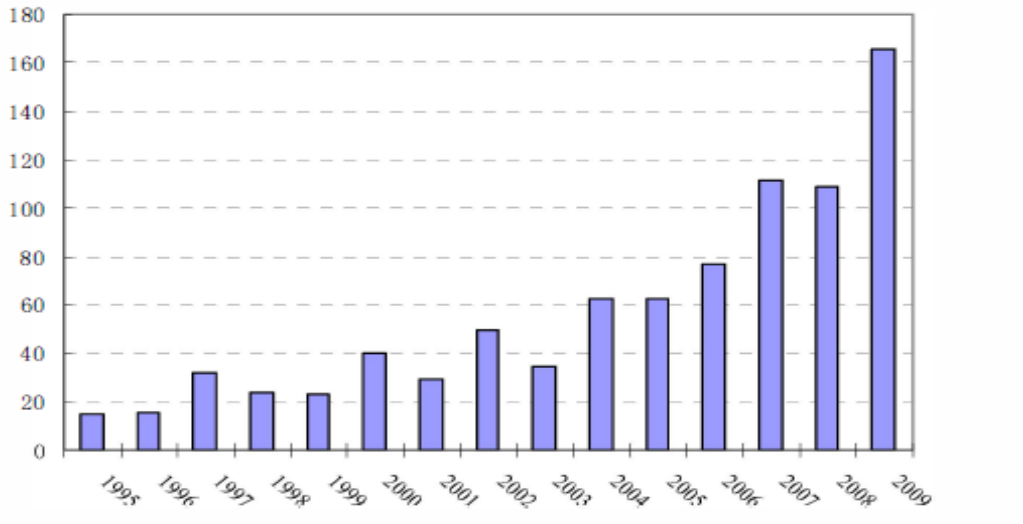

Figure 11: Frequency of carbon management publications from 1995 (Wang et al., 2012)

The debate on climate change is dominated by scientists, economists, corporate leaders and environmentalists with less attention given to innovation in organisations and change management to address this problem. The theoretical developments in organisational studies and corporate practices for mitigating climate change have been limited (Wittneben et al., 2009). Therefore, research on

organisational issues on this topic is relatively new. The extent to which business organisations embrace climate change and carbon management as an integral part of their business models still remains unclear and not well understood (Okereke and Russel, 2010). A number of researchers have attempted to analyse which factors influence business organisations, why and how they engage with climate change mitigation and they argue the case for effective response (Okereke and Russel, 2010).

The previous studies (not mentioned in Figure 10) have focused on organisations' efforts to reduce carbon emissions from the production processes and their participation in emissions trading systems. Furthermore, some of the studies have stressed the need to focus on improving the product and supply chain measures (e.g. Weinhofer and Hoffmann, 2010; Hoffman, 2007). These studies have focused more on greenhouse gas emissions management (e.g. emissions reduction in manufacturing process, design of less carbon intensive products and carbon emissions trading systems), but the focus remains less on understanding the challenges during the process management. However, others extended this view beyond greenhouse management by including strategic option about how climate change can be utilised to develop new products and markets for business sustainability (e.g. Kolk and Pinkse, 2005). Organisations have adopted a range of strategies to gain the required resources and capabilities to improve the performance of carbon management (Kang, 2011). Wittneben and Kiyar (2009) argue that research exists on how business organisations are responding to the challenge of climate change and it has predominantly focused on the strategic and market dimensions of it (Levy and Kolk, 2002, Kolk and Pinkse, 2005, Wittneben and Kiyar, 2009, Okereke and Russel, 2010).

3.4.3. Carbon management strategies

This section presents an overview of the current trends and strategies for carbon management. Carbon management involves stakeholder involvement and measures ranging from low-cost initiatives, such as energy-efficient lighting, to measures requiring greater efforts and investment, such as purchasing more fuel-efficient vehicles or restructuring the energy systems (Wen, 2010). Carbon management activities are those in which organisations are engaged in order to respond to climate change. In the past, companies have been seen to focus on carbon management for strictly political and non-market reasons and to comply with potential government regulations and taxation. However, this appears to have changed in recent years, with a number of market strategies arising from the carbon debate (Kolk and Pinkse, 2004). A number of strategies are provided for managers and executive board members to understand the corporate exposure of climate change and increasing carbon emissions and then mitigate the climate risks to gain competitive advantage in the business environment (Schultz and Williamson, 2005). Carbon management strategies provide an interesting research stream and could have six components; verifying the data of greenhouse gas (GHG) emissions, setting and updating the performance targets, identifying cost-effective emissions reduction, internal communication management, finding new business opportunities and adapting to market-based solutions (Del Pino et

al., 2009). The acknowledgement of the growth of climate change and the business response of organisations is by no means widespread (Kolk and Hoffmann, 2007). Ansoff (1980, P. 133) suggests:

> *"A strategic issue is a forthcoming development, either inside, or outside the organisation, which is likely to have an important impact on the ability of the enterprise to meet its objectives"*

While organisations might face a range of issues (including those that are social), only certain ones are considered significant enough to impact the ability to fulfil corporate objectives (Ansoff, 1980). Despite growth in environmental and sustainability strategy research in recent years, most of the literature consists of anecdotal evidence that is either focused on the cost benefits that the carbon management strategies can offer (Klassen and McLaughlin, 1996), or specific case studies of industries analysing their environmental management policies and strategies (Sharma and Vredenburg, 1998). However, it is still unsure why some organisations are responding to climate change and others are not. The literature on carbon management and associated issues remains in its infancy, and thus provides an opportunity for further research (Jackson, 2008). Due to this, carbon reduction strategies are in infancy (Renukappa et al., 2013). However, a study of corporate carbon strategies of Korean companies' suggests that companies have started considering carbon emissions in their strategic positioning. A comprehensive theoretical framework is developed which divides carbon management activities into six main categories: carbon emissions reduction commitment, product development, process and supply improvement, new market and business development, organisational involvement and external relationship development (Lee, 2012). In China, the established measures to implement carbon management are focused on several specific areas such as carbon emissions reductions, development of low-carbon technologies, adjustment of economic structures and development of low carbon energy. The organisational structure of a firm and business models have contributed significantly to achieve carbon management process (Liu, 2012).

The literature on corporate response to climate change and carbon emissions has started to emerge. 'Corporate carbon strategy' combines the issue of climate change with business strategy in organisations. Several terms are used for this phenomenon such as business response to climate change (Jeswani et al., 2008), carbon strategies (Hoffman, 2007), climate strategy (Kolk and Pinkse, 2005) and corporate CO_2 strategy (Weinhofer and Hoffmann, 2010). The current review suggests that there exists a body of literature on the corporate response to climate change and carbon reduction strategies, but only in limited industries. However, researchers have started to develop strategy frameworks for organisations. For example, Hoffmann and Weinhofer (2010) noted that a company's CO_2 strategy can be understood as 'a pattern of action over a period of time' (Mintzberg, 1989), intended to manage its direct and indirect carbon emissions. A framework is developed that conceptualizes a company's CO_2 strategy as the focus of one or a combination of several strategic

objectives. Figure 12 presents three types of CO_2 strategies, CO_2 compensation, CO_2 reduction and carbon independence, with the measures to manage emissions (Weinhofer and Hoffmann, 2010).

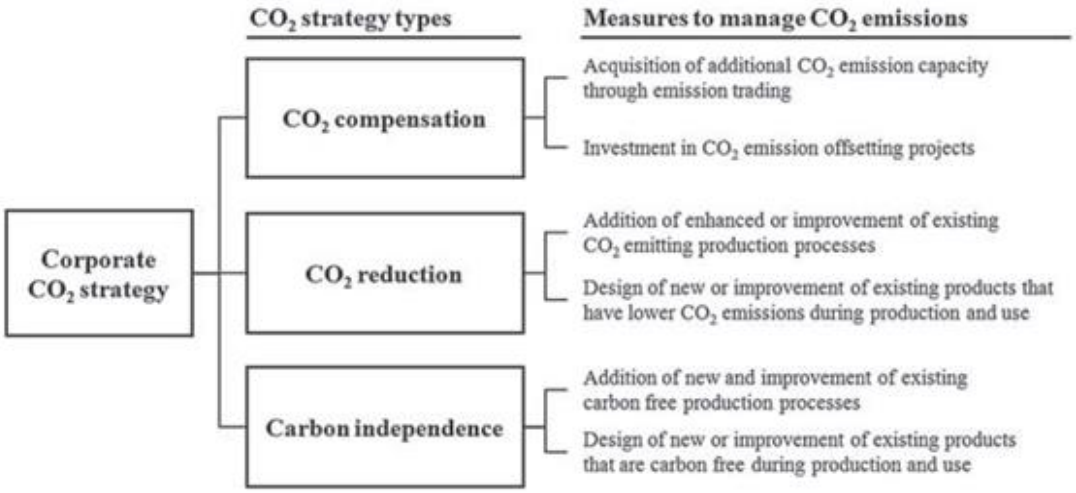

Figure 12: Generic corporate CO2 strategy framework (Weinhofer and Hoffmann, 2010)

According to Okereke (2007), there is still a debate whether carbon management is a matter of Corporate Social Responsibility (CSR) or strategic business decisions. Over 86% UK FTSE companies consider carbon management as a matter of CSR and at the same time, they no longer perceive climate change as a matter of peripheral business concern. This mixed approach indicates a lack of corporate understanding within organisations. Okereke and Russel (2010) in another research on carbon management strategies in UK energy intensive companies found that the companies claim to accept the science of climate change and are actively engaged in developing carbon management strategies to reduce the impacts of climate change. Consequently, senior management within organisations acknowledge that climate change is a strategic issue rather than simply a CSR issue. Schultz and Williamson (2005) developed a five steps model to turn strategic ideas of carbon reduction into a strategic action plan.

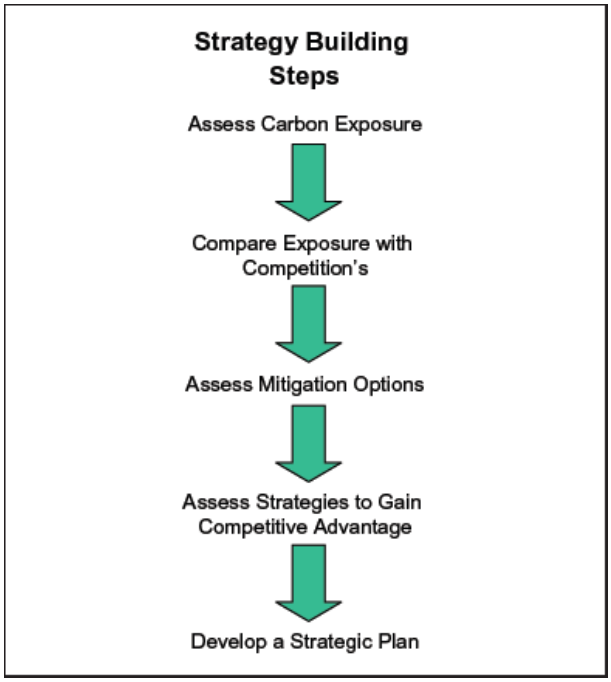

Figure 13: Strategy building steps (Schultz and Williamson, 2005)

In Figure 13, the first step is to understand direct and indirect carbon footprint. The second step is to benchmark organisation's carbon exposure with market competitors, although this may not be an easy task. The next step is to look at the number of options to reduce carbon emissions or at least manage the emissions and the fourth step is for the companies to identify actions and investment plans in a carbon constrained business environment. Once the strategic options are identified, it is important to create a plan of action integrating various steps and creating a clear management of some or all of the issues such as investments, divestments, purchases, sales strategy and public relations. This model gives step by step guidance to companies to develop a strategic approach to reduce and manage their carbon emissions. However, it only deals with the strategic phase of the process, not the implementation phase. It could be improved by addressing the real challenges to help companies further. Challis (2008) addressed implementation and reporting phases as well in his carbon management framework. In the literature, the term carbon management activity is used interchangeably with carbon management measures (Weinhofer and Hoffmann, 2010) and strategic options (Kolk and Pinkse, 2005). There are carbon management strategies/measures available, but their execution is not considered as a top priority. Senior managers should give priority not only to strategic issues, but also to the issues associated with implementation.

> *"Experiences also showed that it is crucial that the CEO or the company's owner gives top priority to the implementation measures and that he or she actively supports the entire project"* (Busch and Shrivastava, 2011, P. 159)

Once management in organisations is aware of the role of the business operations and their impact on the natural climate, they can take necessary steps to mitigate the impacts (Kolk and Pinkse, 2005). However, there is a counter argument that managers are getting awareness of climate change issues

increasingly, but further climate change education is needed in the managerial world (Wittneben and Kiyar, 2009). A survey study shows that many of the UK managers are clear about carbon management as a business issue. Almost two thirds of respondents (64%) agree or strongly agree that carbon management will become more important in the next three years. The majority of the managers (69%) reject the idea that there is little that their organisation can do to reduce its carbon footprint. However, only 26% are actively managing their carbon footprint. Only one third of managers have clear measures in place for calculating the carbon footprint (Wehrmeyer et al., 2009). In addition, corporate carbon management is not only limited to mitigation internally, but it also comprises of supply chain optimisation, product-related improvements, and compensation activities (Busch and Wolfensberger, 2011). Based on the previous research, in Table 9, Lee (2012) presented a comprehensive list of carbon management activities by classifying them into six categories.

Carbon management activity	Specific practices and related research
Emission reduction commitment	• GHG reduction target setting (Jeswani *et al.*, 2008; Hoffman, 2005) • Internal transfer of emission reduction (Kolk and Pinkse, 2005)
Product development	• Product development (Kolk and Pinkse, 2005) • Designed-for-environment products (Boiral, 2006) • Designing new products that emit less CO_2 or improving existing products to be more carbon free during their production and use (Weinhofer and Hoffmann, 2010)
Process and supply improvement	• Energy efficiency enhancement (Hoffman, 2005; Dunn, 2002) • Process improvement and supply chain measures (Kolk and Pinkse, 2005) • Investment in plant retrofit projects and new plants (Schultz and Williamson, 2005) • Better housekeeping, change in process technology and GHG inventory (Jeswani *et al.*, 2008) • Developing new production processes that emit less CO_2 or improving existing processes to be carbon free (Weinhofer and Hoffmann, 2010)
New market and business development	• New market and product combinations (Sprengel and Busch, 2010; Kolk and Pinkse, 2005) • Developing new products and technology solutions (Hoffman, 2005)
Organizational involvement	• Firms' awareness of opportunities for achieving energy efficiency and the impact of their activities on climate change, management involvement in climate change initiatives and the encouragement of employees to take initiatives (Jeswani *et al.*, 2008)
External relationship development	• Emission trading and the CDM (Jeswani *et al.*, 2008; Dunn, 2002; Boiral, 2006; Kolk and Pinkse, 2005; Schultz and Williamson, 2005; Hoffman, 2005) • Participation in voluntary programs (Jeswani *et al.*, 2008) or in the political process (Sprengel and Busch, 2010; Hoffman, 2007) • Making GHG data publicly available (Sprengel and Busch, 2010; Jeswani *et al.*, 2008)

Table 9: Carbon management activities and related research (Lee, 2012)

Management has two options under a flexible regulatory framework. Option 1 is to place greater emphasis on improving business activities through innovation. Option 2 is to adopt compensatory approaches such as buying carbon emissions credits from carbon markets. Companies can adopt any of these two approaches, either on their own or with their external stakeholders (Kolk and Pinkse, 2005). The choice between innovation and compensation is a strategic decision whether to 'make' or 'buy' carbon reductions. It could be better if organisations move towards innovation, not only in technology rather in their operating procedures. This research is focused on product and process industry and may have different implications for business organisations providing services. The main difference between innovation and compensation is the fact that innovation improves a company's technological assets and core competencies, but compensation does not affect a company's technological assets and competencies. Furthermore, innovation and compensation go in parallel and

a company (compensator) cannot buy emissions credits from the market, if there is no seller that offers credits acquired by carbon emissions reductions through the innovation process (Kolk and Pinkse, 2005).

> *"An innovation strategy improves a company's assets and competencies as a result of the development of new environmental technologies or services that reduce emissions, whereas compensation involves the transfer of emissions or emission-generating activities"* (Kolk and Pinkse, 2005, p.2)

Kolk and Pinkse (2005) presented a framework to identify corporate carbon strategies through cluster analysis. Lee (2012) followed the same methodology of cluster analysis in his study and divided Korean companies in six clusters according to their corporate carbon strategies: Wait-and-see observer, Cautious reducer, Product enhancer, All-round enhancer, Emergent explorer and All-round explorer. He measured the firms' performance against corporate carbon strategies. Other attempts are also made to categorise corporate carbon strategies by characterizing carbon activities by few researchers, as presented in Table 10.

Research	Carbon strategy types	Remark
Weinhofer and Hoffmann (2010)	all-rounder, compensator, substituting compensator, reducer, substituting reducer, preserver	a cluster analysis with a sample in the electricity industry
Sprengel and Busch (2010)	minimalists, regulation shapers, pressure managers, emission avoiders	a cluster analysis with a sample of the Dow Jones global index companies
Jeswani *et al.* (2008)	indifferent, beginner, emerging, active	a cluster analysis based on a continuum model with a sample from Pakistan and the UK
Kolk and Pinkse (2005)	cautious planner, emerging planner, internal explorer, vertical explorer, horizontal explorer, emissions trader	a cluster analysis with a broad sample of FT500 companies
Levy and Kolk (2002)	avoidant, resistant, compliant, proactive	case studies of the oil industry

Table 10: Carbon strategy typology (Lee, 2012)

There is significant research on corporate climate strategies in energy intensive companies. A study also analysed the major developments in the oil industry, observing significant shifts in corporate climate strategies through detailed comparative case studies. The variations in timing, pace and types of strategies was found in the study. The factors which affect corporate position of companies are location, economic & market and internal organisational factors (Kolk and Levy, 2001). Corporate carbon strategies are getting established in terms of research studies and researchers have carried out their work in this emerging field (see Table 11) and the studies have used cluster analysis to classify organisations according to their carbon strategies (Levy & Kolk, 2002; Kolk & Pinkse, 2005; Jeswani et al., 2008; Weinhofer & Hoffmann, 2010).

Mitigating Climate Change – How Do Corporate Strategies Differ?

Dunn (2002)	• Energy efficiency enhancement • Fuel switch • Application of new technologies • Emission trading • Investment in project-based emission offsetting
Kolk and Pinkse (2005)	• Process improvement • Product development • New market/product combination • Internal transfer of emission reduction • Supply chain measures • Acquisition of emission credits
Schultz and Williamson (2005)	• Investment in plant retrofit • Investment in new plants • Investment in offset projects • Purchase of emission allowances • Divestment from business activities with too much current or potential carbon exposure
Boiral (2006)	• Investment in clean technologies • Design-for-environment products • Purchase of emission permits on international CO_2 markets • Launching of reforestation programs • Use flexible Kyoto mechanism
Hoffman (2006)	• Efficiency enhancement • Technology shift • Acquisition of assets that balance a company's production facilities portfolio • Development of new products and technology solutions • Forest sequestration • Purchase of emission offsets • Sourcing of renewable energy
Jeswani *et al.* (2008)	• Change in process technology, or process modification, or input material, or product specification • Installation of energy-efficient equipment • Participation in Kyoto flexible mechanism (ET, JI or CDM)
The Conference Board (2007)	• Reduction of energy consumption • Energy efficiency enhancement • Fuel switch • Applying renewable energy sources • Carbon emission trading • Carbon emission sequestration

Table 11: Measures available for GHG management (Weinhofer and Hoffmann, 2010)

3.4.4. Carbon management process and models

This section reviews how the carbon management process works within organisations. Hoffman (2007) conducted research and named carbon management as climate-related strategy to reduce greenhouse gas emissions. Climate-related strategies are *"a set of goals and implementation plans within a corporation intended to reduce GHG emissions, produce significant GHG-reduction co-benefits, or that otherwise respond to climate-related changes in markets, public policy, or the physical world"* (Hoffman, 2007, p.3). A climate change strategy helps companies understand their climate exposure and risks, prepare for regulations and take advantage of opportunities. Hoffman (2007) defines the stages of climate related strategy-development process. There are three stages which have further steps (see Table 12). The first stage is the 'Develop a Climate Strategy' involving the main steps such as assessing emissions profiles, identifying risks and opportunities, evaluating options for actions and setting targets. The second stage is the 'Focus Inward' which involves the development of financial mechanisms to support climate change programs and organisational engagement. The third stage 'Focus Outward' is the formulation of a policy strategy and management of external relations.

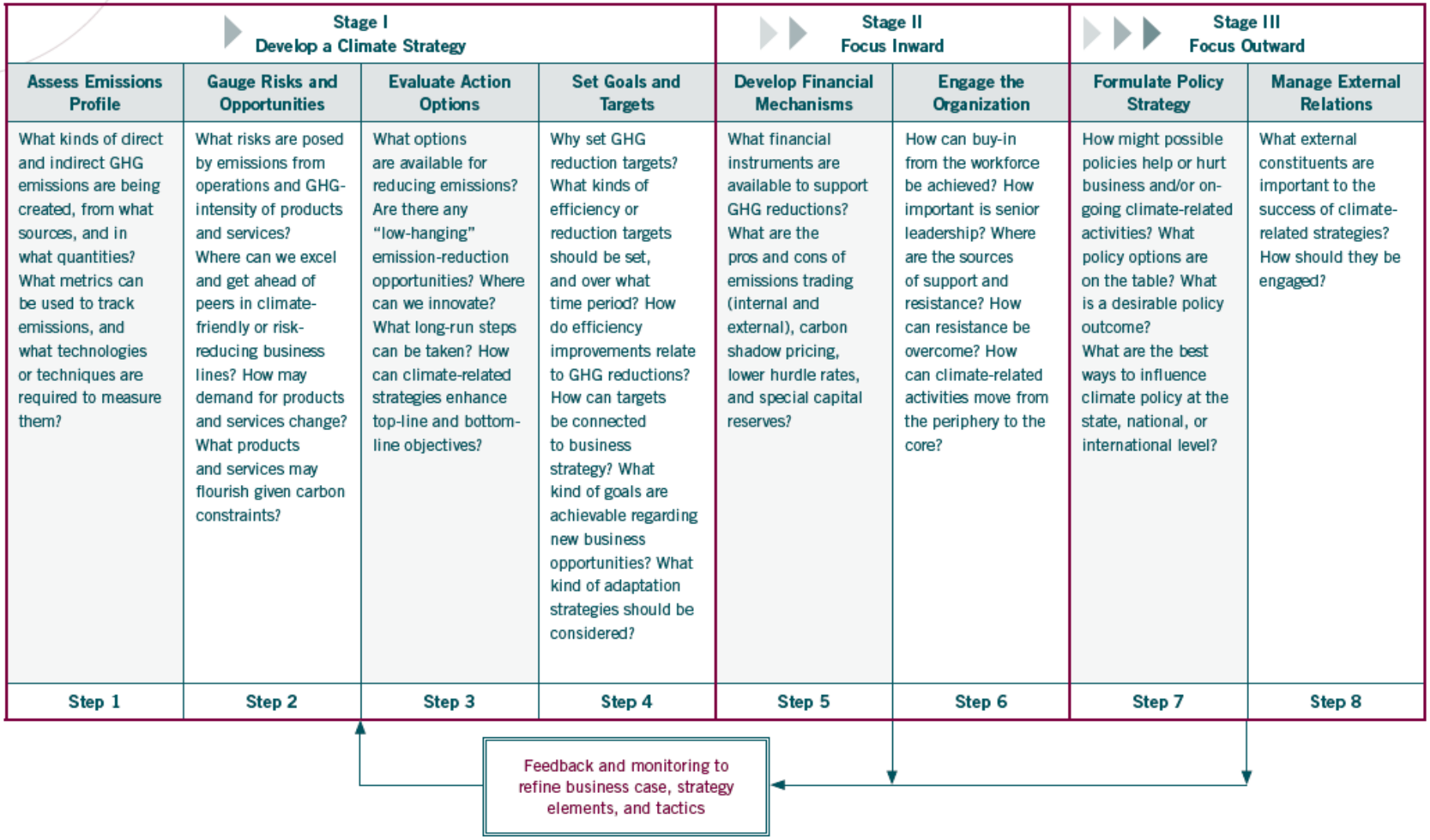

Table 12: Stages of climate related strategy-development process (Hoffman, 2007)

Challis (2008) developed a carbon management framework which follows a systematic approach to reducing carbon emissions. The flow chart diagram (Figure 14) sets out the organisation-wide process of carbon management. In this framework, the first stage is to work through a structured process of understanding a carbon emissions baseline of the organisation. Then, it also involves issues such as stakeholder engagement, targets, communications, and implementation, monitoring and reporting. This framework involves both strategic and operational phases during the process as opposed to Schultz and Williamson (2005). However, there are overlaps in this framework and the framework proposed by Hoffman (2007).

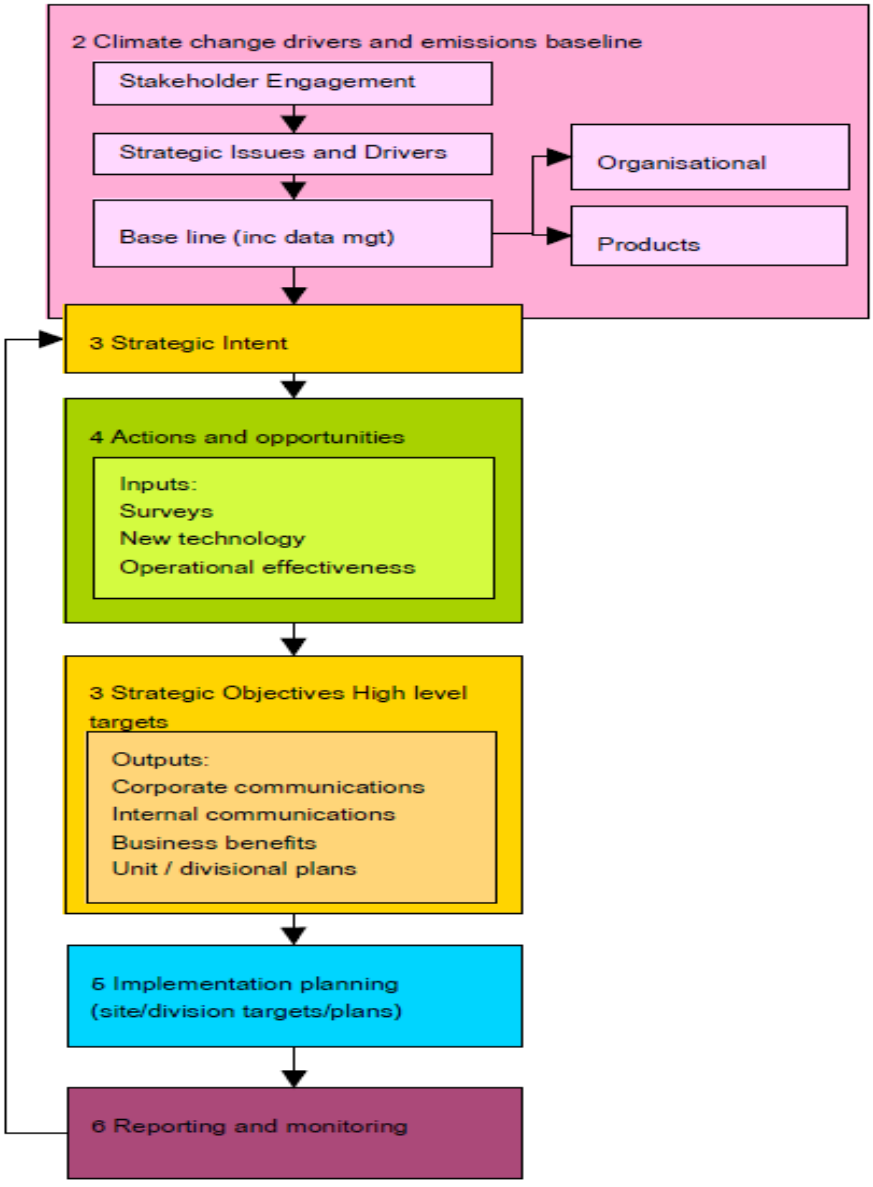

Figure 14: The carbon management framework: a systematic approach (Challis, 2008)

A contradictory view exists that climate change mitigation is not simply about reducing carbon emissions. Already, there are signs that we face a far more fragile future in which supply of natural resources can no longer be taken for granted. There are also other concerns such as acidification of the

oceans, the consequences of which could be even greater than the issue of climate change over a period of time. So a more fundamental change will be required (Czerniawska, 2007). Most large business organisations have developed management systems and processes to effectively manage carbon emissions and business risks. However, minority of organisations, perhaps 20% of the total, have weaknesses in their management systems and processes (Sullivan, 2009). A framework was developed to assess the companies by focusing on their management processes. The companies need to implement these key processes to identify, understand and manage the risks associated with GHGs (Sullivan, 2009). The performance of any company can be measured against seven broad areas proposed by Sullivan (2009).

1. Governance
2. Climate change policy
3. Risk assessment
4. Emissions inventories
5. Emission reduction targets
6. Implementation strategies
7. Participation in leadership initiatives and GHG emissions performance

Many countries have already initiated a range of low carbon practices, but a significant area is low-carbon cities/communities which focuses on either strategies or technologies to reduce carbon emissions (Zhang et al., 2013). There has been a recent shift of carbon reduction in business organisations. As businesses and organisations are aware of the environmental risks and they are making improvements. Carbon management allows organisations to recognise areas for carbon reduction and potential energy efficiency projects. However, about 75% of the organisations have not yet measured their carbon emissions (The Carbon Trust, 2010) and many organisations do not have a focused approach to carbon management. Czerniawska (2007) argues that the greatest opportunities of carbon management improvements come from cost-saving energy efficiency measures and making the investment in carbon management is a valuable practice for businesses. However, the cost of carbon is not yet high enough to focus the attention of senior management. Thus, carbon reduction is still one of many things waiting for funding and strategic commitment. This is not as depressing as it sounds and by raising the cost of carbon, it may be possible to drive organisations to pursue economic and environmental goals (Czerniawska, 2007).

Wehrmeyer et al. (2009) argue that most managers recognise the importance of low carbon agenda, but far too many of them are doing nothing about it. The failure to act on carbon management originates from a lack of senior leadership. Boardroom scepticism on this issue is a major hindrance to the action on carbon emissions. However, there are positive signs which can form the basis of a more proactive approach to carbon management. Therefore, clear board-level responsibility and accountability for delivering specific carbon management projects is needed (Wehrmeyer et al.,

2009). Dembo (2008) argues that senior management should have an adequate understanding of carbon management process and the risks and opportunities associated with increasing carbon emissions. He also added that organisations need a 'chief carbon officer' responsible for measuring and reducing carbon emissions and ensuring that carbon emissions integrated into strategic planning (Dembo, 2008). Subramaniam et al. (2015) recommended incorporating carbon perspective into strategic planning to ensure effective corporate carbon management. There is insufficient understanding of managers' key arguments or business logic for adopting sustainability strategies (how 'business cases' are developed, how effective they are and what barriers they may face). This could indicate a lack of descriptive research in this area (Salzmann et al., 2005). Czerniawska (2007) found that many organisations are adapting a wait-and-see approach and are measuring carbon footprint, but without taking active steps to reduce it beyond simple energy saving and recycling initiatives. If they were, the level of national emissions could be falling, but they are still rising. This could be due to the growth. Most of previous studies are focused on identifying corporate response to climate change and identifying the drivers of corporate climate strategies with little attention given to the theoretical development of models or frameworks for understanding corporate action and inaction. Therefore, it provides direction for future research work (Wittneben and Kiyar, 2009).

3.4.5. The need for a strategic approach

In the past, the corporate contribution to climate change was not considered a strategic issue and emissions of GHGs were taken for granted. Emerging carbon constrains should be reflected as a central part of an organisation's vision (Busch and Shrivastava, 2011). Due to combination of regulations, consumer pressure and an underlying desire to cut business cost, carbon management has been slowly moving up the corporate agenda (Czerniawska, 2007). Weinhofer and Hoffmann (2010) support this argument that increasing regulatory pressure, public opinion, and environment oriented consumers and financial institutions have led companies to at least consider climate change in their strategic management. The strategic importance of carbon is expected to grow over the next ten years and seem to be embedded in businesses as a long-term priority (Carbon Disclosure Project, 2010), which conflicts with the Carbon Trust (2010) stating that majority of the organisations have not measured emissions. In contrast, Renukappa et al. (2013) found that the extent to which business organisations in industry are embracing carbon management as an integral part of business models is unclear and not well-understood. Therefore, companies need to consider 'carbon exposure' as more than an environmental compliance matter, but rather than a key strategic factor in future corporate decisions and competitiveness (Schultz and Williamson, 2005). Worthington and Patton (2005) carried out a study on Small and Medium Enterprises (SMEs) and found that management decisions within the organisations lack in strategic thinking and therefore, innovative response is needed for both demand and supply sides benefits. Another research on SMEs emphasises the necessity and possibility to implement low-carbon strategy as it is a new topic (Huaide and Jingrong, 2011).

Therefore, much of the focus remains on what organisations should be doing in corporate environment and there is similarity in the arguments.

There is an argument that the effects of climate change on business operations of organisations are tangible and certain that this issue can be best addressed with the help of the tools developed by strategist not the philanthropist (Porter et al., 2007). Academics have attempted to gain a better understanding of firms' carbon strategies by exploring their climate change response (Lee, 2012). The actual and potential strategic impacts of climate change on companies are intensifying (Kolk and Pinkse, 2005). Management research on the topic of corporate carbon strategies within organisations is still a relatively new endeavour and only few studies have analysed firms' responses to climate change from a strategic perspective. Yet most of the studies of corporate carbon strategies have examined large sized and international firms (Lee, 2012). Structural change is needed within organisations for carbon management and a wider thinking will make managers think beyond business operations to their strategic decisions. This suggests that more research on carbon strategy from organisational and management perspective is needed (Wittneben and Kiyar, 2009).

Managers and senior management teams in most of the industries have started to realise carbon-constrained economy, but there is a need to take a strategic approach (Schultz and Williamson, 2005). In contrast, a survey conducted by the Price Waterhouse Coopers (PwC) suggests that businesses do not currently have a strategic approach (Schultz and Williamson, 2005). Strategic carbon management is an approach to address the carbon and financial cost of an organisation's operations. Strategic management of carbon is complex matter and starts with understanding the ways carbon management can affect the organisational activities – both tangible and intangible. For example, the operational aspects such as process efficiency and alternate energy sources, regulatory aspects, or possible impacts on company reputations based on stakeholders' perceptions, carbon has the potential to impact the bottom line (Two Tomorrows Group, 2012). Strategic carbon management provides an understanding of the way in which organisations are translating strategic issues into management actions in the context of their carbon impact (Bebbington and Barter, 2011). It is needed to examine the strategic response of organisations to carbon reduction. Strategic management of carbon will provide an effective approach to issues such as capital costs of investment, strategic decision-making, and carbon reduction target setting, sourcing funding, building business cases and winning internal support in an organisation (Deloitte, 2013).

The adoption of corporate carbon management practices reduce carbon emissions (Doda et al., 2016) and they help to explore opportunities to gain competitive advantage (Schultz and Williamson, 2005). A survey found that 60% of 2,000 executives consider that climate change is an important aspect in their strategy, but translation into actions remains very limited (McKinsey, 2008). However, the reality is that it is difficult for leading and high-impact organisations to reduce their absolute carbon

emissions due to business growth and while many expect to improve their emissions intensity over a certain period of time. However, business growth is a key issue and actually means that the majority of companies expect their carbon emissions to continue to increase (Sullivan, 2009). Busch and Shrivastava (2011) introduced a corporate carbon management framework (Figure 15) for organisations to be carbon-efficient. It consists of seven steps to reengineer organisations and it was applied in several empirical case studies. In summary, the term 'strategic' has become buzzword and is vague. However, there is no benchmark whether carbon management is strategic or not.

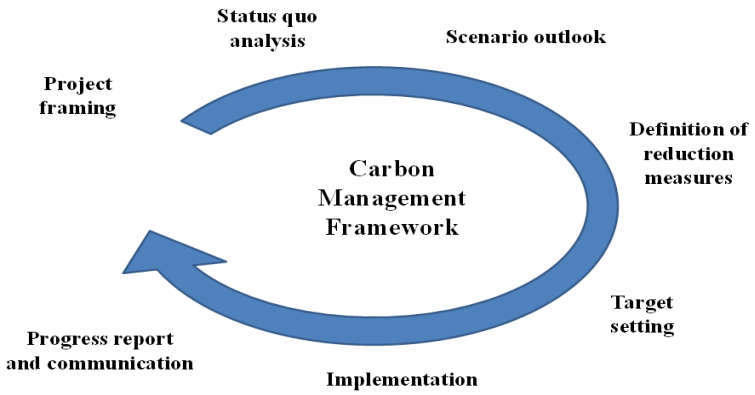

Figure 15: Corporate carbon management framework (Busch and Shrivastava, 2011)

3.4.6. Boundaries of carbon management

Determining an organisation's carbon management boundary (where it beings and ends) and responsibility is challenging. Regulatory schemes provide guidance, but these set narrow carbon management boundaries covering only scope 1 and 2 emissions. The concept of 'carbon neutrality' implies broader carbon management boundaries incorporating indirect emissions (scope 3). The 'carbon neutrality' claims net zero carbon impact within an organisation. Embracing a broad boundary of carbon management poses a number of practical challenges in terms of measurement up and down the value-chain and attempting to trace carbon. It is time and resource intensive (Burtis and Watt, 2008). There is another argument that one organisation's scope 3 carbon emissions are another organisation's scope 1 emissions, and questions can be raised about the appropriateness of one organisation taking responsibility for another organisation's direct carbon emissions. Most of the organisations have adopted relatively narrow carbon management boundaries (scope 1 and 2, along with business travel from Scope 3), but some have accepted responsibility for a variety of other indirect emissions (Burtis and Watt, 2008).

Scope 3 carbon emissions is a major issue and is getting attention. Busch and Wolfensberger (2011) argue that corporate carbon management is not only limited to climate change mitigation, but it also considers supply chain optimisations, product-related improvements, and compensation activities.

Therefore, a life-cycle context is relevant for corporate competitiveness and a framework of eight carbon management strategies is developed based on the Industrial Organisations (IO) literature and each strategy contributes to the potential competitive advantage (Busch and Wolfensberger, 2011). The companies are now aware of life-cycle wide thinking of assessing the environmental impacts because of the intensifying stakeholders' pressure to manage it and a whole value-chain perspective on greenhouse gas emissions is essential for system-wide reductions (Busch and Wolfensberger, 2011). Examples are the Carbon Disclosure Project (CDP) and the California Climate Action Registry (2009). Both accelerate the discussion on scope 3 emissions as per Greenhouse Gas Protocol Standard (WRI and WBCSD, 2004). It requires significant amount of work for institutions to fully integrate system-level analysis into GHG management. Currently, GHG emissions reduction from stationary sources is relatively more feasible as compared to reducing mobile GHG emissions. Due to this, mitigating GHG emissions from mobile sources has received less policy attention because of complexities of measurement and a lack of attractive options associated with it (Williamson, 2012).

Organisations commonly include only waste sent to landfill and employees' business travel in scope 3 emissions (The Carbon Trust, 2012c). Sullivan (2009) found in the study of large European companies that reporting beyond the direct and indirect carbon emissions (electricity) is not consistent. Even though companies provided some data on emissions from the sources that are not owned or controlled by the company (scope 3), this tended to be confined to business travel and, to a lesser extent, transportation and logistics. Companies provided limited information on carbon emissions from their supply chains or the use/disposal of their products and services. There was no study found which has explored the challenges around scope 3 carbon management. This makes it an area of potential research. There are two arguments of not reporting carbon emissions beyond direct and indirect scope 1 and 2 emissions.

> *"The first is the limits to responsibility and, specifically, whether the reporting of such emissions should be the responsibility of the company or of its suppliers or customers? Second, calculating emissions from supply chains and product use is technically difficult and there is, as yet, no consensus on the calculation methodologies or even on the 'scope' of the supply chain or of the product life-cycle"* (Sullivan, 2009, p.6).

3.5. Carbon management in the public sector

This part of the literature presents carbon management strategies in the public sector with a focus on HE sector, as it is indicated that there is a significant relationship between a firm's carbon strategy and its sector and size (Lee, 2012). Public sector is an important sector in regard to carbon management. "*In an era where the need for austerity and cuts are frequently discussed, opportunities can often be overlooked. The case for the public sector to invest in comprehensive carbon management programmes is compelling, especially as fuel and electricity prices have risen steeply in recent years"* (Pryce, 2012, p. 1). But, public sector carbon management is not well addressed in academic literature. Ball et al. (2009) recommends considering research into the area of 'carbon

neutrality' within public sector organisations. Bebbington and Barter (2011) carried out a research on the strategic response to the climate change in public and private sector organisations and found that it is not just about reducing the carbon footprint of an organisation, it is how that organisation is thinking about carbon and thinking about what it needs to do for adaptation and contribute towards sustainable development in the context of the decisions and the duties it undertakes. The researchers have developed matrices for corporate climate strategies as strategic options to reduce carbon emissions in energy intensive companies or mainly for the companies producing the products through the production processes. There is a need to focus on the organisations which provide services (public sector organisations) to the community in order to fill the carbon management research gap. Public sector organisations are central to deliver sustainable development and environmental sustainability practices. Every aspect of their role from education to environmental services, and from planning to social care, shapes how people live their lives. Most of the public sector organisations in the UK accept their leadership role and have been pursuing a range of policies and strategies over the last two decades (Birney et al., 2010). Mallaburn (2008) argues that it is important to look at how organisations approach carbon emissions and policy and what motivates them to make savings. The 'carbon world' has learned lessons about businesses and public sector drivers.

In engineering and technology field, significant literature exists on technical solutions to reduce carbon emissions, whilst addressing the issues such as corporate response to carbon reduction, public perceptions of it, planning, economics and politics (Ball et al., 2009). Ball et al. (2009) argue that there has not yet been any analysis on how public sector organisations address carbon emissions to mitigate climate change. The Carbon Trust (2012b) states that the public sector has led the way in cutting energy costs and emissions and their research has revealed that the UK public sector is the most committed to carbon reduction as compared to private and third sector organisations. Over half (58%) of the public sector representatives reported that their organisations planned to make 'tangible investments' in carbon reduction in 2012. 77.9% of the respondents agree that carbon reduction remained a key facet of the organisation's objectives, despite the challenging financial situation (The Carbon Trust, 2012b). The public sector still recognises the benefits of carbon management even in the economic downturn, and sees the short-term as well as long-term benefits of doing so (The Carbon Trust, 2012b). However, a further research may test the Carbon Trust's argument and gain insights into the distinct position of the public sector, particularly when there are funding cuts in the public sector. The major parts of the public sector such as universities, Local Authorities (LAs), National Health Services (NHS) and schools have developed plans and strategies. There is a huge volume of practitioner's literature on public sector carbon management available in the form of strategies and implementation plans. Bryan et al. (2011) found that proactive actions are required by the public sector organisations to reduce carbon emissions. There has been increasing interest in responses of

private sector organisations to climate change, but little research has taken place in public sector context.

In regards to LAs, they have a significant role in carbon management both at local and regional level (Fleming and Webber, 2004). However, majority of the English and Welsh LAs are not making substantial progress and only a small number of them have developed GHG inventories, strategies and implemented those (Allman et al., 2004). In contrast, Atkinson (2013) argues that some English local authorities have shown real policy commitment to reduce their carbon emissions, but the overall picture remains mixed. Health sector is also developing a systematic approach to it (Pencheon et al., 2010), but it is not a central priority for the health department and further progress needs corporate commitment and departmental leadership (Griffiths, 2006). Nejati et al. (2011) state that everyone has a moral duty of striving for sustainability to preserve the planet and there is no excuse for doing nothing. This applies to all of the HEIs including universities. Universities are centres of knowledge generation and sharing which has a very important role in solving world's problems by ensuring a sustainable future. World leading universities are committed to the core areas of Corporate Social Responsibility (CSR) (Nejati et al., 2011). However, CSR is more focused on the social aspects of sustainability. Carbon management is one of the important environmental issues and the government should continue to support best practice throughout the sector. The public sector has an opportunity to lead by example and influence the private sector organisations (Wehrmeyer et al., 2009).

3.5.1. Strategic carbon management: A route map

Although public sector carbon management has not received much attention in academic literature, Horgan (2011) has provided a comprehensive strategic carbon management (SCM) routemap detailing various strategic issues. It involves the integration of various strategic themes in the process; most common themes within an organisation are low carbon culture, low carbon strategy, stakeholder engagement, low carbon procurement, financial case, metering and monitoring and performance evaluation. This framework involves a five step approach to carbon/energy management starting with senior management's commitment to the monitoring and controlling the carbon/energy management performance. However, this framework does not provide a systematic process and the themes are not joined up. However, this route map for public sector organisations has some themes in common with the frameworks developed for other sectors by Hoffman (2007) and Challis (2008).

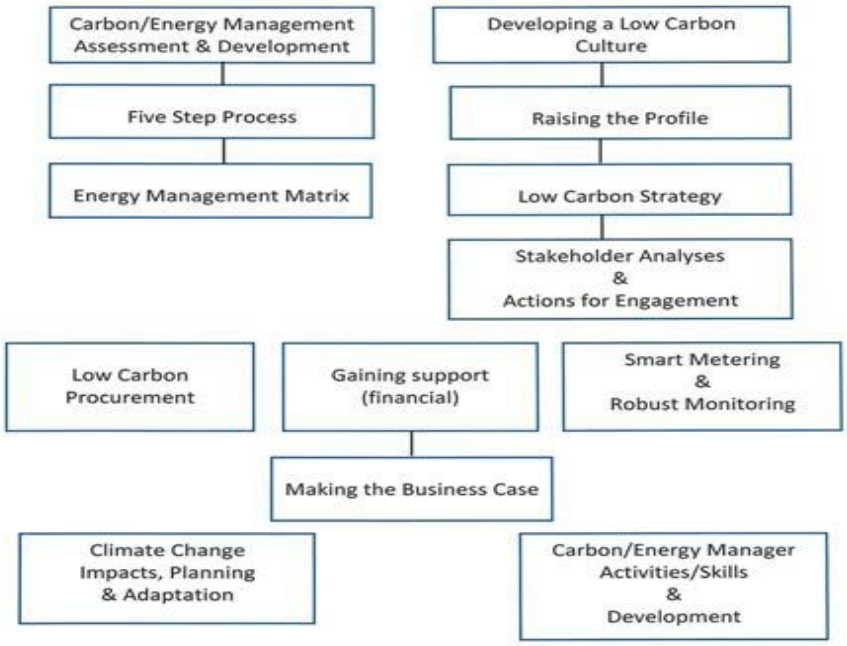

Figure 16: Strategic carbon management (SCM) routemap (Horgan, 2011)

Figure 17: Five step approach to carbon management (Horgan, 2011)

Wittneben and Kiyar (2009) state that organisational and management strategies to address climate change have various limitations. Firstly, there is a tendency to treat business organisations as isolated units away from their social and political context to develop climate strategies. Secondly, strategic management process is focused on the analysis of the external business environment and firm capabilities to explore the best course of action for the business. Strategic management offers no insights into how or why firms might act to change the environment by addressing climate change and this is one of the limitations, if one is concerned about how to achieve transformational change within organisations. Finally, it is argued that embedding sustainability and disruptive innovation and the notion of change in strategic management reflects incremental rather than transformational change. Organisational theory is out of its depth in situations where radical actions are required, as in the case with addressing climate change. A broader theoretical perspective is required to understand the process of change in organisations (Wittneben and Kiyar, 2009). The engagement of executive members and senior management is a core part of the action plan and it will place the carbon

reduction at the heart of the organisation's strategic and operational approach, but this is challenging (Energy Saving Trust, 2009). This also seems overlooked. In order to understand the effectiveness of an industry, it is important to analyse corporate response to mitigate carbon emissions across different sectors in different countries (Jeswani et al., 2008).

3.6. Carbon management in the Higher Education (HE) sector

Colleges and universities are like towns or small cities having huge population of students, faculty and staff members and they have significant environmental impact and financial influence (Eagan et al., 2008). Universities and colleges have clusters of energy-consuming buildings, ranging from weekday-only classrooms and offices to energy-intensive research labs that are in operation 24/7. The energy intensive equipment and laboratory spaces have impact on emissions which is 10X greater than other spaces. For example, a medical school could have more energy intensive facilities that may result more emissions of larger research based universities (Klein-Banai and Theis, 2013). The energy requirement of buildings is the largest factor in the carbon footprint of most schools based on the direct energy use in buildings and typically accounts for 70–90% of a school's direct carbon and other GHG emissions (Eagan et al., 2008). However, this study does not consider indirect emissions. Ozawa-Meida et al. (2013) measured the carbon performance of De Montfort University, UK through a consumption-based carbon footprint including scope 1, 2 and 3 emissions and found that the scope 3 emissions comprise of around 79% of the university's greenhouse gas emissions. This rise in carbon emissions is attributed to the growth of the campus (Spirovski et al., 2012; Andrews et al., 2015). Klein-Banai and Theis (2013) support this by stating that universities are complex institutions made up of many buildings used for mixed functions and operate for longer hours. Ward et al. (2008) conducted sector review of the UK HE energy consumption and found that there has been a gradual but steady increase in the levels of aggregate energy consumption, as discussed in Chapter 1. Their review revealed that the energy consumption in the UK HEIs increased by about 2.7% over a period of 6 years between 2001 and 2006 (Ward et al., 2008). Due to this, the HE sector has taken a leadership role in carbon reduction and aims to be a role model of sustainability agenda and carbon management is part of that.

> *"Higher education can serve as a model of sustainability by fully integrating all aspects of campus life"* (Cortese, 2003, p.15).

The higher education (HE) sector, due to the nature of its business activities, emits both direct and indirect carbon emissions (HEFCE, 2010b). Cortese (2003) argues that HE plays a critical role but its role is often overlooked in making this vision a reality There are various opportunities at the sector level to change growth and development pathways for lowering emissions through a range of measures (Altan, 2010). Research carried out by Bryan et al. (2011) suggests that the most cost effective opportunities to achieve carbon reduction targets exist in the Further and Higher Education sector. The HE sector is being encouraged by HEFCE to lead in carbon management due to its strategic role in education and research and have long lasting impact due to students (HEFCE, 2020b).

There is a need to understand that how HEIs can strategically reduce and manage their increasing carbon emissions. This review suggests that there exists written material on the role of HE in carbon management, but not many studies have focused on actual carbon management practices and their challenges. Carbon reduction target and strategy for HE in England is formulated to provide guidelines for HEIs to set their own carbon targets and strategies, as discussed in Chapter 2. However, targets alone do not achieve requisite results; they need to be supported by effective carbon reduction strategies and actions. HEFCE (2010b) argues that governing bodies are responsible for oversight of the strategic management process of HEIs and carbon management being a key strategic issue is a crucial area for governors in strategic decision-making.

> *"The governing body is responsible for oversight of the strategic management of the institution's land and buildings with the aim of providing an environment that will facilitate high-quality teaching and learning and research. Carbon management is a key strategic issue, so it is a crucial area for governors who should be informed and involved in decision-making on the institution's approach to reducing its emissions"* (HEFCE, 2010b, p. 17).

EAUC et al. (2015a) found in the HE sector study that senior management support is valuable and influential to enable action on environmental sustainability, but in most cases, staff do not believe that appropriate level of support exists. Lozano (2006) suggests holistic approach to carbon management and argues that it is more likely to be achieved through a joint bottom-up approach than a disjointed and expensive top-down approach. HEIs are legally independent and universities are being made to operate like business organisations. Increasingly, institutions are reporting greenhouse gas emissions as a means to measure sustainability (Klein-Banai and Theis, 2013). Universities are the centres of knowledge and play a key role in solving world's important problems through building a sustainable future (Nejati et al., 2011). Institutions have recognised themselves that they are well placed to take on a leadership role (Klein-Banai and Theis, 2013). Their governing bodies are primarily responsible for effective management and planning of the institutions. Therefore, leadership, governance and management in HE have become hot topics (Hamid et al., 2007). There is relatively less academic literature available on carbon management within HE sector, which is one of the gaps in the existing knowledge. In contrast, there is 'grey' literature available in the form of carbon management plans of universities and HEFCE policy/strategy documentation.

These carbon management plans and strategies currently deal with only scope 1 and 2 emissions because HEFCE has produced targets and strategy only for scope 1 and 2 emissions. Many universities have responded well to the HEFCE instructions on carbon management so far, as demonstrated by the publication of their CMPs (Robinson et al., 2015). This carbon management programme provides technical and change management support for carbon management because according to a study in the HE sector, 83% HEIs reported technical and non-technical initiatives aimed at carbon and energy reduction (Altan, 2010). Technical strategies are technology based initiatives for energy and carbon reduction and non-technical initiatives target the same goal through

behavioural modification and structural changes in institutions. Staff and student engagement could be an effective way to change the culture. But, environmental issues were not rated very high either by staff or students when they were asked to rate the major issues faced by HEIs. However, 40% of staff and 47% of students were aware of the correct carbon reduction target of the university (Robinson et al., 2015). This level of awareness and understanding appears significant for a university.

The case of HEIs' energy and carbon emissions reduction is considered more complex than other organisations due to heterogeneity of the sector (Altan, 2010). Most of the discussions on carbon management are in regard to scope 1 and 2 emissions. The main focus of greenhouse gas emissions reductions in universities seems to be mainly on buildings' energy consumption, because buildings are the larger contributor in carbon emissions and are in the direct control (Klein-Banai and Theis, 2013). Moreover, Robinson et al. (2015) believe that scope 3 is likely to be the most significant part of a typical university's carbon footprint and recommends refining and standardising the methods for assessing scope 3 emissions. This study complements the findings of Ozawa-Meida et al. (2013). Universities are currently lacking in this approach and the literature has also ignored this issue. HEIs have adopted various green procurement schemes to address the downstream energy consumption covering areas such as construction, stationary and catering etc. (Altan, 2010), but, Barker (2013) states that facilities management departments probably do not think about the environmental impact of services and supplies (scope 3). In general, the Carbon Trust developed a five-step process to help companies implement carbon management (The Carbon Trust, 2005) and it is also suggested to universities. This five step approach in Figure 18 is well known in energy and environmental management as well as carbon management. These steps provide comprehensive guidance on carbon management process from mobilisation to its implementation.

Figure 18: The Carbon Management Programme five-step process (The Carbon Trust, 2005)

There is no one-size-fits-all approach for developing carbon management strategies in HEIs. The content and structure of the carbon management strategy will vary among institutions and reporting structures and responsibility for its implementation will also vary. Institutions should consider how a carbon management strategy will fit in their own context and support existing policies and strategies, as well as what its role will be in delivering regulatory obligations (HEFCE, 2010a). Robinson et al. (2015) provided a reality check on carbon management in universities with a focus on English Russell Group universities. This is one of only few carbon management studies. They found that current CMPs are not a good indicator of future performance and the HE sector in England has underestimated the challenge. All of the universities have set carbon reduction targets, but the targets are extremely ambitious and may be unachievable in reality. Universities that set realistic but relatively low targets can be penalised in league tables and could be labelled as having a lack of ambition even when they are more likely to succeed in delivering these targets. In addition, Robinson et al (2015) argue that absolute carbon reduction targets could present unintentional barrier to carbon management. Universities are advised to set the targets by utilising the three Key Performance Indicators (KPIs), Full-Time Equivalent (FTE) staff and student numbers, gross internal area and

income. This view is supported with a quotation that "*Gross internal area, staff and research student full-time equivalent were found to have highest correlation with energy consumption across the sector and may be used as proxy indicators for energy consumption as well as the targets of interventions"* (Ward et al., 2008, p. 2939). This could facilitate comparisons among universities regardless of the institutional size and scope, which suggests that the HE sector could be in a better position to monitor progress in future. But this view contradicts with the HEFCE requirements and the Climate Change Act 2008 which demand absolute carbon reductions. Robinson et al. (2015) state that soft methods of awareness and engagement can solve some of the carbon management problems, but this might not be true, as universities need both soft and hard methods. Their research does not discuss organisational issues associated with carbon management and discusses education for sustainable development and carbon reduction targets in detail with a critique on carbon management plans.

Carbon emissions have increased in most of the universities in the UK over the past five years and there is a concern that universities will fail to meet the stringent targets of 2020. This rise in emissions in universities has put the targets in doubt, particularly; elite Russell Group universities in the UK are among the worst performers in CO_2 reduction (Williams, 2011). EAUC et al. (2015a) also reported that around two fifths of sustainability staff in HEIs thinks that their institutions are very unlikely or unlikely to meet targets. People & Planet quotes that *"the planning is there, the policy is there, to a certain extent the resourcing is there, but the performance is just lagging behind. On current trends, the sector is nowhere near reaching the emissions cuts required of all public sectors by the Climate Change Act"* (Williams, 2011, p. 1). This suggests that the implementation part and actual practices of carbon management are important.

3.7. Drivers and barriers to carbon management

This section reviews the drivers and barriers to carbon management in an organisational context in general and HE sector perspective in particular. Okereke (2007) researched that there are a number of drivers and motivations for carbon management. He argues that drivers are different from motivations. The term 'driver' is used for the factors that have the potential to 'force' organisations to take actions even if they do not want to do so. This is the external pressure on organisations from government regulations, pressure from the public and NGOs and also investor pressure. The term 'motivation' refers to the factors concerned with those aspects of carbon management which present a potential business opportunity for an organisation, usually increased profit, enhanced market reputation and competitive advantage. Thus, motivation comes more from within the organisation whilst drivers are the external forces. Whilst acknowledging the difference between the drivers and motivations as discussed by Okereke (2007), the two terms are used interchangeably in the research. Okereke (2007) presented the motivations, drivers and barriers during his study of the UK FTSE 100 companies in Table 13.

Categories	Drivers
Motivations	Profit Credibility and leverage in climate policy development Fiduciary obligation Guiding against risk Ethical considerations
Drivers	Energy Prices Market shifts Regulation and government directives Investors pressure Technological change
Barriers	Lack of strong policy framework Uncertainty about government's action Uncertainty about the marketplace

Table 13: Motivations, drivers and barriers related to corporate climate actions (Okereke, 2007)

Okereke (2007) found 'profit' and 'energy prices' as the most important motivation and driver, which could indicate that organisations are concerned about their financial capital. He stated that 100% of FTSE companies reporting actions to address climate change on their website make a link between carbon management and profit. The second and third most important driver is market shifts and government regulations (Okereke, 2007). In contrast, Leal Filho (2011) argues that financial benefit plays an important role for institutions implementing sustainability policies, but it is not the primary motivator. Weinhofer and Hoffmann (2010) state that increasing pressures from regulations, consumers, public opinion and financial institutions have led organisations to consider climate change in their strategic management. Jackson's (2008) research on the drivers for carbon management shows that companies are of the view that carbon management has a business case demonstrating cost reduction, profit maximisation and enhanced competitive advantage in the market.

Okereke (2007) proposes three main barriers to enact carbon management within UK FTSE 100 organisations, which include a lack of strong policy framework, uncertainty of government actions and uncertainty in the market place. Subramaniam et al. (2015) argue that the regulatory landscape relating to carbon management has now become a political controversy. There exists uncertainty in government policies and increasingly changing technological developments also raise significant challenges to implement carbon management. Okereke (2007) suggests that the absence of a clear, long-term and robust government policy framework imposes limitations on key decisions and many organisations find it difficult to justify investment decisions. In addition, there exists uncertainty and companies fear a change in policy stance of government, which can be a problem for organisations. Liu (2012) summarised barriers to carbon management in his study of Chinese industrial organisations. These barriers are divided into four categories in Table 14.

Categories	Barriers
Structural barriers	Employment term limits imposed on managers affect long-term low carbon strategies Staff must demonstrate to boss the ways in which new recommendations are consistent with past ways, thereby entrenching a particular path No incentives are built into the budgetary system that stimulates low carbon innovation Long history of plan-oriented economy can inhibit company's efficient decision-making Hierarchical system inhibits flexibility and innovation Isolating low carbon production within the structure of firm
Regulatory barriers	Policy frameworks lack necessary specification for implementation Lack of a common definition of low carbon production Uncertainty about government's action Lack of detailed implementation plans paired with monitoring mechanisms
Cultural barriers	Silos between planning and production Operations staff are often in a physically separate location from planning sector, and so are less connected to the decision-making Strong organisational culture of risk aversion
Contextual barriers	Uncertainty about climate change impacts may force adaptation instead of mitigation, and a focus on short term planning Competing priorities inhibit commitment to low carbon production Lack of low carbon technology Uncertainty about the market place

Table 14: Barriers to carbon management (Liu, 2012)

There has not been any detailed analysis of barriers to carbon management within public sector. However, some studies in the context of HE and LAs have identified some barriers. Table 15 presents description of barriers to carbon reduction and climate change mitigation in LAs. In HE, EAUC et al. (2015a) found that securing finance is the major barrier to deliver sustainability, followed by a lack of human resources (HR), lack of senior management commitment and lack of student engagement. Butt (2014) found that staff and students do not see what it is in it for them and staff's loyalty is predominantly towards the university's business (Butt, 2014). Arvidsson (2004) conducted research on environmental management practices in Swedish universities and explored a lack of time and resources and organisational structure as the key barriers. Pryce (2012) argues that there are opportunities for public bodies through low or no-cost measures such as optimisation of the existing facilities and behaviour change. Altan (2010) in a study of energy reduction in universities stated that the growth of the HE sector is one of the biggest challenges universities are facing. The goal of energy and carbon reduction is difficult to achieve given the level of growth in the HE sector and this is one of the major barriers. Andrews et al. (2015) found that universities that invested capital in building envelope, infrastructure and mechanical systems made more progress in energy and carbon reduction in USA, suggesting a key role of investment to scale up carbon management. The drivers and barriers

are studied mostly from industrial organisational context. Whilst there is no literature on the drivers and barriers to carbon management in universities in particular, this section provides an overview of why organisations implement carbon management and what stops them doing so. This suggests that there is a gap in the study of drivers and barriers, providing an opportunity for further investigation. Universities are now operating as business organisations, therefore, many of the drivers and barriers may be in common between universities and business organisation in other sectors.

Barriers
Lack of awareness or interest from councillors
Lack of awareness or interest from other public sector organisations (e.g. health)
Lack of funding
Difficulty coordinating different departments within the authority
Lack of appropriate government guidance
Difficulty coordinating between county and district councils.
Insufficient staff or staff time
Lack of awareness or interest from voluntary and community sector organisations
Difficulty delivering climate change actions through other plans and strategies (e.g. reducing pollution, traffic congestion, etc.)
Lack of awareness or interest from council staff
Other issues take higher priority in the council
Difficulty coordinating regionally between adjacent areas
Lack of ICT support
Lack of awareness or interest from local businesses
Lack of awareness or interest from the public
Insufficient local authority powers
Difficulties in exploiting EU assistance
Local resistance to specific schemes (public, community groups, businesses, etc.)
Need to bid for project funding uses too many resources
Risk of litigation (planning appeals etc.)

Table 15: Barriers to address climate change in LAs (Allman et al., 2004).

3.8. Universities as business?

In recent years, changes in the HE sector have significantly reduced the differences between universities and other types of business organisation. Therefore, universities are operating like business organisations (Robinson et al., 2015). The significant majority of HEIs now derive funding directly from student fees and with the removal of the student number control cap; universities are effectively operating in an open market with students as customers of universities. However, Christine (2007) has argued that the specificity of universities should not be ignored due to the teaching and research activities and change should build on the specificities. Similarly, Arat (2011) stated that there are fundamental differences between the higher education and other business organisations providing services, but higher education institutions should be improved by benchmarking them with the service industry in a competitive market place. In essence, the current changes in the UK HE sector have made universities operate like typical business organisations. Increasing demand for higher education with decreasing government funding and market driven environment has directed higher education

institutions to focus on quality management similar to other business organisations. Furthermore, it is assumed that students are the customers (Arat, 2011; Lomas, 2007). The notion of customer focus has begun to be used in public sectors such as municipality services, hospitals and universities with their customer focused management (Arat, 2011). Based on this review, issues relating to carbon management in universities can be compared against the carbon management practices in business organisations in other sectors or industries, because corporatisation and commercialisation of universities in the developed countries such as UK has made them similar to business organisations (Parker, 2011).

3.9. Discussion and conclusions

This chapter presents a critical review of the literature around carbon management in organisations. Carbon management plays a key role in the transition to a low carbon future and enables organisations to identify sources of carbon emissions, measure these emissions and explore effective strategies to reduce and manage these emissions (Wahyuni and Ratnatunga, 2015). There are few academic papers looking at carbon management strategies in public (Atkinson, 2013; Bryan et al., 2011; Ball et al., 2009; Fleming and Webber, 2004 and Allman et al., 2004) and HE sectors (Robinson et al., 2015; Klein-Banai and Theis, 2013; Ozawa-Meida et al., 2013 and Altan, 2010). None of the studies have focused on organisational processes, which inform the focus of the current research. However, there is significant literature on the strategic impact of climate change on businesses and the range of strategies being adopted by the business organisations in different sectors, as reviewed in Section 3.4. Some studies have focussed on corporate response to climate change and corporate climate/carbon strategies with very less direct empirical knowledge on strategic carbon management discussing organisational issues. Much of the literature remains at a descriptive level presenting the significance of carbon reduction, with less attention paid to developing frameworks or models for understanding the prospects and limits of organisational carbon strategies particularly in public and HE sector context. It is mainly focused on manufacturing and other energy intensive sectors. However, changes in HE sector have reduced the differences between universities and other business organisations. Therefore, universities are also operating in similar kind of market driven competitive business environment. There are studies that have sought to analyse HE sustainability related issues in organisational context and have provided insightful results (for example, Lozano, 2013; Tilbury, 2011; McNamara, 2010; Sharp, 2009; Alshuwaikhat and Abubakar, 2008; Velazquez et al., 2006 and Shriberg, 2000). These studies have focused on wider sustainability issues and Tilbury (2010), Alshuwaikhat and Abubakar (2008) and Velazquez et al. (2006) have proposed models for sustainability in universities ignoring the factor of carbon management. The research on greening the campuses or academia is also carried out by some of the researchers (Zhang et al., 2011; Tilbury, 2010; Lukman et al., 2009; Dahle and Neumayer, 2001). Despite this, sustainability in HE is a relatively new and emergent area (Wright, 2010).

Similarly, Robinson et al. (2015) argue that very few studies have focused on HE carbon emissions and their management approaches. The volume of academic literature on strategic carbon management is less, but various practitioners' and policymakers' documents, guidance reports and carbon management plans and strategies are available in the public and the HE sector. Most of these are treated as a secondary data in this study. The sector organisations have produced guidelines to develop carbon management plans and implementation strategies for the public sector bodies including universities. Most of the carbon management strategies exist in 'grey' literature, discussing what universities should do for carbon management. HEFCE has proactively taken a lead on carbon management in the HE sector and have raised the profile of carbon management (Robinson et al., 2015). However, the literature has started emerging, but there is little evidence of what key features or elements are influential for robust SCM in universities. However, no study has yet explicitly derived a framework for universities providing guidelines to implement and embed carbon management. Empirical research examining the drivers and barriers to strategic carbon management in universities is sparse, however, drivers and barriers in other industries are explored (Section 3.7). There is a major gap in the consideration of scope 3 emissions in carbon management strategies. Thus, SCM is an under-researched and under-developed area of study, particularly in the context HE sector (Mazhar et al., 2014).

Wahyuni and Ratnatunga (2015) support this argument that carbon management is an under-researched area with little empirical research. In the academic world, the question of how can HE sector organisations, particularly universities, respond to climate change by implementing SCM is still unanswered. The term 'carbon management' has emerged in the last few years and so, the literature on carbon management and associated issues remains in its infancy and provides a good opportunity for further research. The term 'carbon management' is mainly used in this chapter for review purposes, because the term 'strategic carbon management (SCM)' is not evident in the literature. This suggests that the term SCM is undefined in the literature. Overall, the literature review has highlighted the following major gaps in the current knowledge that this study aims to address:

1. A clear definition of strategic carbon management.
2. How universities are implementing organisation-wide strategic carbon management.
3. The drivers for and barriers to strategic carbon management in universities.
4. Critical success factors of strategic carbon management in universities.
5. The role and perspective of stakeholders in the process of strategic carbon management.
6. A systematic framework or model for strategic carbon management in universities.

Chapter 4: Research methodology

4.1. Introduction

This chapter presents the methodological considerations and choices for the research methods to meet the research aim and objectives. It gives justifications for the chosen research design detailing how the research questions are addressed. This chapter begins with the philosophical assumptions underlying this thesis. The characteristics of different research approaches, strategies and methods are discussed. The methodological decisions taken in the study are presented, explained and justified. The limitations of the research strategies and methods are also explored, detailing how these are addressed in the chosen research design. At the end, this chapter deals with the credibility of the research in terms of validity, reliability and generalisation.

4.2. Research design

Research design is the logic providing links between data collection and conclusions to be made to research questions ensuring coherence (Rowley, 2002). Before starting any research, it is important to choose and justify the research methodology to be adopted. If a researcher does not give attention to the research design, he or she can face complications during the process (Robson, 2011). The research strategy and methods are informed by the research question. There are multiple ways of designing and conducting the same research study (Robson, 2002). Saunders et al. (2003) present the research process in the 'research onion' in Figure 19.

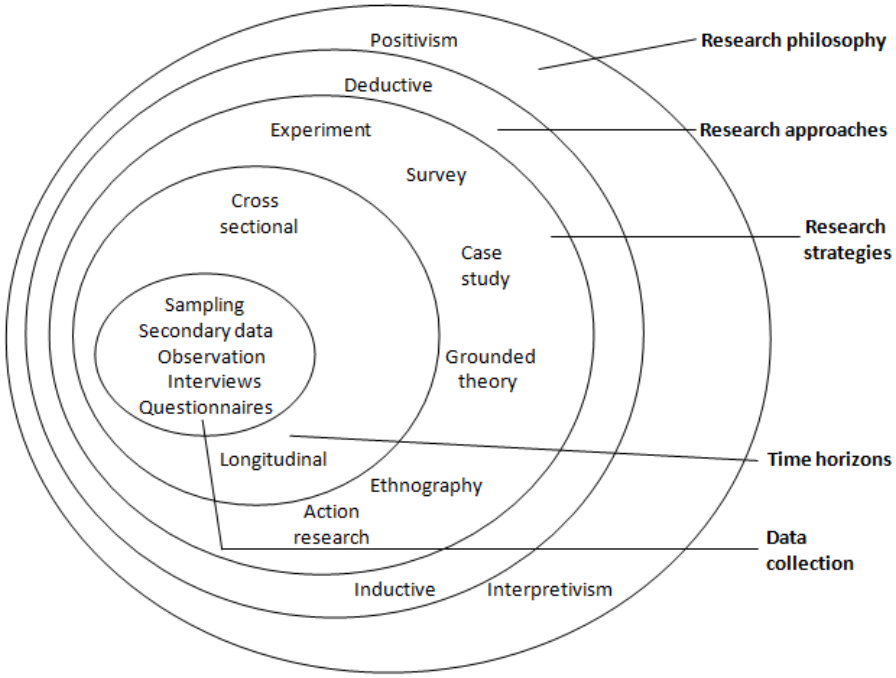

Figure 19: The research process 'onion' (Saunders et al., 2003)

4.3. Research philosophy

In Figure 19, research philosophy is the first layer of the research onion developed by Saunders et al. (2003). There are three broad philosophical views which are positivism, interpretivism and realism. They are different, if not mutually exclusive, about the way in which knowledge is generated and judged as acceptable (Saunders et al., 2003). These are the main philosophical assumptions applied to gain insights about the world. Thus, a relationship exists between theoretical stance adopted by a researcher, the research methodology and the data collection methods (Crotty, 1998). If the research philosophy reflects the principles of positivism, then it is indicative of the philosophical stance of a natural scientist that prefers working with an observable social reality. The end product of this type of research can be law-like generalisations similar to those that are produced by physical and natural scientists (Remenyi et al., 1998). The researcher is an objective analyst, who produces detached interpretations after the data collection. Positivism holds that an accurate and value-free knowledge generation is possible in the research study. However, it holds the possibility that human beings and their actions and institutions can be studied as objectively similar to the natural world (Fisher, 2003). "*Within this approach, the implication is that knowledge can only be gained from direct experience or observation, and it is the only knowledge available to science. The long-held assumption is that by separating facts from values, knowledge (or research) is value-free. Thus, by implication, anything that cannot be tested 'scientifically' cannot be defined as acceptable knowledge"* (Bull, 2008, p.77).

Interpretivism is an epistemological position, which contradicts with positivism (anti-positivist or post-positivist stance). This philosophy is designed in such a way that a strategy is required for research and it differentiates between the objects of the natural sciences and the people. Therefore, it requires subjective meaning of the social actions (Bryman, 2004). This is an anti-positivist philosophical stance looking for culturally derived and historic interpretations of the social world (Crotty, 1998). The strongest argument the interpretivist researcher could make is the necessity to discover the details of the social phenemenon to understand the reality or perhaps the reality behind that (Remenyi et al., 1998). This is also termed as 'constructionism or social constructionist', because this indicates that the world is socially constructed and subjective in nature (Gray, 2004). Knowledge could be constructed as a result of personal experience of social context. People interact with the natural environment and make sense of it through their interpretations of happenings around them. It is the role of interpretivist to understand the subjective reality to make sense of it and understand participants' motives, actions and intentions (Saunders et al., 2003). Interpretivism argues that natural and social realities are different and require different research methods.

The third philosophical position is 'Realism'. Ritchie and Lewis (2003) describe that realism is based on the belief that an external reality exists independent of beliefs and understanding of individuals. "*A clear distinction exists between the beliefs about the world and the way the world is"* (Ritchie and

Lewis, 2003, p.16). Saunders et al. (2009) argue that the essence of realism is based on what the senses show us as reality. It is the truth and that objects have an existence independent of the human mind. Realism is a branch of epistemology similar to positivism, because it assumes a scientific approach for developing the knowledge. The philosophy of realism claims that there is a reality independent of the human mind. Saunders et al. (2009) describe two types of realism, direct realism and critical realism. Direct realism aims to explain what you see is what you get and our experiences reflect the world accurately. Critical realism states that what we experience are sensations and the images of the things in the real world, but not the things directly.

This research was concerned with studying the social world of universities and adopted 'critical realism'. As researchers, we will only be able to explore what is happening in the social world around us, if we understand the social structures that have given rise to the phenomena that we are trying to study. The critical realist's position is that our knowledge of the reality is a result of social conditioning (Saunders et al., 2009). Critical realism is valid where 'how and why' questions are posed and does not need to conform with a pre-determined theoretical framework. This philosophy is more relevant to new fields of study where there is a lack of knowledge and it helps in knowledge production (Saunders et al., 2009). Based on that, this philosophy could help explore how the social settings of universities are implementing SCM as a result of objective realities of carbon emissions and climate change. Observations with the help of data collection tools and techniques are interpreted and conveyed for investigation. This research involves realist aspects such as carbon footprint, energy consumption, associated cost, dates and duration of interviews and meetings. These are all part of an 'objective' reality that could be interpreted, responded to and altered through strategic actions of universities. This research aims to investigate how receptive universities are to the objective realities, understanding the strategic response of middle and senior managers to address increasing emissions. Critical realism argues that only knowing the reality is not enough, it needs subjective response to it. Such objective realities produce 'real' boundaries to and constraints on the behaviour and link with subjective issues such as resources, leadership, policies, knowledge base and strategic priority to solve problems. This philosophy holds the view that the researcher can use his/her experience and pre-existing knowledge to develop understanding of the phenomenon which is being investigated (McEvoy and Richards, 2006). There are examples of applying critical realism in research. Jeppesen (2005) adopted critical realism to research environmental management practices in Small and Medium-sized manufacturing Enterprises (SMEs) in South Africa, which supports the philosophical stance of this study.

4.4. Research approaches

There are two research approaches in research design; deductive and inductive approach. Deductive approach aims to design a research strategy to test a theory or hypothesis (Saunders et al., 2003). In this approach, the existing literature forms the basis of carrying out further research. Deductive

approach works from more general to a particular case and this owes more to positivism philosophy (Saunders et al., 2003). Deductive approach is often called 'top-down' approach. The inductive approach involves data collection and then develops a theory from data analysis (Saunders et al., 2003). Induction tends to look for patterns and themes associated with real observations, whereas deduction generates propositions and possible hypothesis theoretically as a result of systematic data analysis (Ritchie and Lewis, 2003). Inductive approach works from specific observations to broader generalisations and possibly leads to theory development. This approach owes more to interpretivism and such labelling is potentially misleading (Saunders et al., 2003). Inductive approach is often called 'bottom-up' approach. It is possible to combine both of the approaches in the same study and it could be advantageous to do so (Saunders et al., 2009). *"The inductive and deductive methods are not mutually exclusive. A researcher may turn a collection of data into a set of concepts, models or even theories (inductive approach) which are tested through experimentation (deductive)"* (Gray, 2004, p.11). Table 16 presents the differences between deductive and inductive approach.

Deductive approach	Inductive approach
• Scientific principles • Moving from theory to data • The need to explain casual relationships between variables • The collection of quantitative data • The application of controls to ensure validity • The operationalization of concepts to ensure clarity of definition • A highly structured approach • Researcher independent of what is being researched • The necessity to select samples of sufficient size	• Gaining an understanding of the meanings humans attach to events • A close understanding of the research context • The collection of qualitative data • A more flexible structure to permit changes of research emphasis as the research progresses • A realisation that the researcher is part of the research process • Less concern with the need to generalise

Table 16: Differences between deductive and inductive approach (Saunders et al., 2009)

There is another type of logic used by realists as an alternative to deductive and inductive approach. This is called 'abductive' approach, which cycles between deductive and inductive approach (Robson, 2011). This logic introduces an innovative social sciences approach, 'systematic combining'. *"Systematic combining can be described as a nonlinear, path-dependent process of combining efforts with the ultimate objective of matching theory and reality"* (Dubois and Gadde, 2002, p.556). There is a continuous movement between an empirical world and a model world in systematic combining, which is one of its key characteristics. The research issues and the analytical framework are successively reoriented when they are confronted with the empirical world in this process. It is a process where theoretical framework, empirical fieldwork, and case study analysis evolve at the same

time and is useful for developing potential theories. Systematic combining can be discussed in terms of two processes. The first is matching theory and reality, while the second deals with direction and redirection of research (Dubois and Gadde, 2002). Dubois and Gadde (2002) argue that in this approach the role of analytical framework is different from inductive and deductive approach. Figure 20 presents the ingredients of systematic combining.

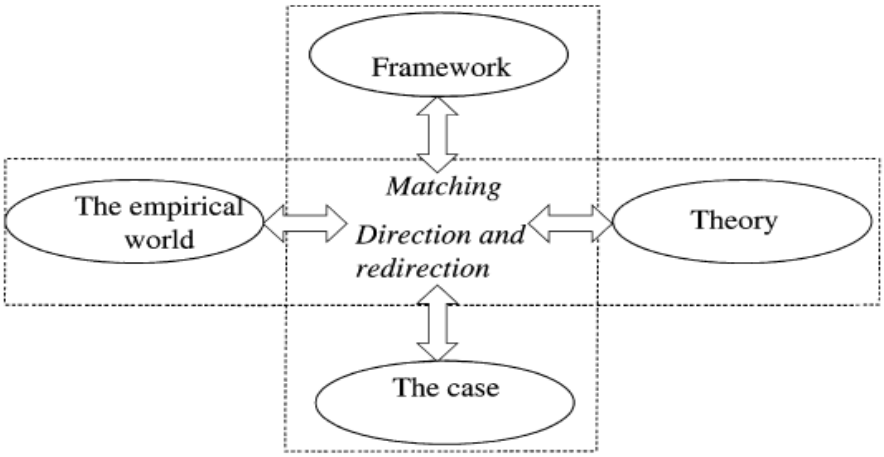

Figure 20: Systematic combining (Dubois and Gadde, 2002)

This research adopted the innovative social science approach of systematic combining using adductive logic. This refers to the simultaneous integration of a theoretical framework (in this case, SCM), empirical fieldwork (seventeen semi-structured interviews and a survey to elicit HE perspectives on SCM) and a case analysis of De Montfort University (DMU). Using 'abduction', the purpose of this study was to explore the relationship between 'everyday language and concepts'. Closer to grounded theory and the development of theory (rather than theory generation), this research supports the view that looking at one case in depth, as opposed to comparing multiple cases, is a valid approach, whilst acknowledging the need to exercise caution in making generalisations. This approach could help produce theoretical insights on this nascent topic. However, the research design does not prove or disprove a theory or generate a hypothesis. Dubois and Gadde (2002) justify the selection of this approach:

> *"Systematic combining is closer to an inductive than a deductive approach, the continuous interplay between theory and empirical observation is stressed more heavily than in the 'grounded theory' approach. The abductive approach is to be seen as different from a mixture of deductive and inductive approaches. An abductive approach is fruitful if the researcher's objective is to discover new things - other variables and relationships. Similar to 'grounded theory', main concern is related to the generation of new concepts and development of theoretical models, rather than confirmation of existing theory. We stress theory development, rather than theory generation. One major difference, as compared with both deductive and inductive studies, is the role of the framework"* (Dubois and Gadde, 2002, p. 559).

4.5. Phases of the research

This research was carried out in two iterative phases. The first phase of the research consists of content analysis of CMPs and semi-structured interviews with university managers and other key individuals from the HE sector organisations. The second phase of the research entails a quantitative survey of the UK HE sector and an in-depth case study of DMU. The data collection methods in the case study are semi-structured interviews with the middle and senior managers, content analysis, participant observations of the Sustainable Development Task Force (SDTF)[2] and other relevant meetings and also personal communications. The first phase of the research helped form the basis of a structured and more focused approach in the second phase. Abductive approach-systematic combining supports this approach in this study. The second phase of the research observes the modification and validation of the findings. This technique is supported by Dubois and Gadde (1999) who argue that in the research studies which rely on abductive approach, the original research framework is successively modified, partly as a result of unanticipated empirical research findings, but also from theoretical insights that are gained during the process The survey findings were also fed into the case study to explore the issues further with greater depth. Figure 21 presents both phases of the research.

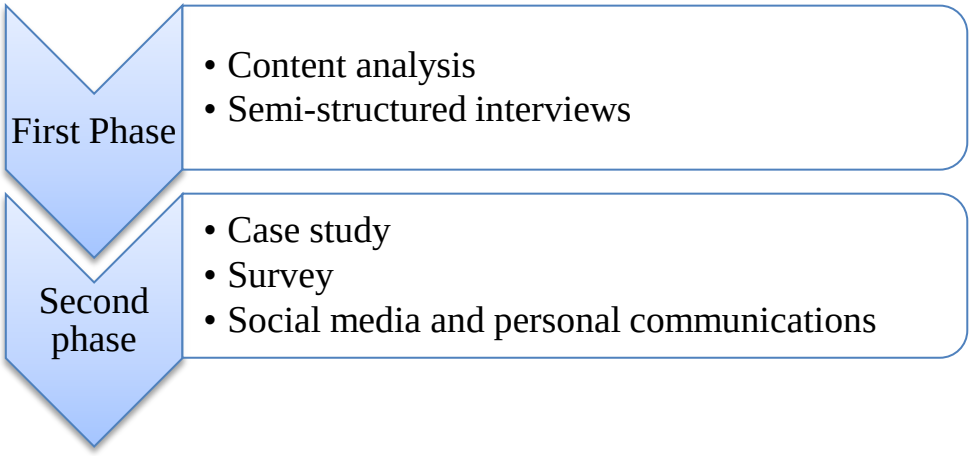

Figure 21: Two phases of the research

4.6. Research strategy

This section discusses the third layer of the 'onion'. This study is exploratory in nature as it aims to explore the nascent topic of SCM in universities. Exploratory study seeks to investigate what is currently happening and questions are asked about a particular phenomenon. This is useful when not enough knowledge is available about a particular topic (Gray, 2004). Key themes are sought and combined with the literature to cross reference the research findings. There are different strategies

[2] The SDTF is a cross faculty and departmental group of individuals implementing sustainability and carbon management at DMU. This is discussed in detail in Section 7.5.1 in Chapter 7.

available for both deductive and inductive approaches and they should not be treated as being mutually exclusive (Saunders et al., 2003). The selection of strategy depends upon the research question (Robson, 2011). There is a fixed, flexible or multi-strategy design strategy.

Fixed design: Robson (2011) describes that a fixed design demands pre-specification of the design before the main data collection starts. Mostly, data are always in the form of numbers in this design strategy and this is referred to as a 'quantitative strategy'. For example, surveys, and experiments.

Flexible design: A flexible design evolves during the data collection process. Data are generally non-numerical (not in numbers) and is referred as a 'qualitative strategy' (Robson, 2011). For example, case studies, ethnographic studies, grounded theory, phenomenology and action research are flexible design strategies and typically involve multiple data collection methods (Robson, 2011).

Multi-strategy design: Multi-strategy design is a combination of both fixed and flexible design. Normally, a flexible design phase is followed by a fixed design phase, whereas the reverse is rare (Robson, 2011). Table 17 presents the overview of different strategies used in research.

Strategy	Purpose of research
Surveys	• Measure some aspect of a social phenomenon or trend • Gather facts in order to test a theory
Case studies	• Development of detailed and intensive knowledge about a single case or of a small number of related cases • Understand the complex relationship between factors as they operate within a particular social setting
Experiments	• Identify the cause of something • Observe the influence of specific factors
Ethnography	• Seeks to capture, interpret and explain how a group, organisation or community live, experience and make sense of their lives and world • Describe cultural practices and traditions • Interpret social interactions within a culture
Phenomenology	• Describe the essence of specific types of personal experience • Understand things through the eyes of someone else
Grounded theory	• The aim is to generate theory from data collected • Clarify concepts or produce new theories • Explore a new topic and provide new insights
Action research	• Solve a practical problem • Produce guidelines for best practice
Mixed methods	• Evaluate a new policy and gauge its impact • Compare alternative perspectives on a phenomenon • Combine aspects of the other strategies

Table 17: Research strategies and their purposes, adopted from Denscombe (2010) and Robson (2011)

Different strategies are employed depending upon the research question. All of the strategies in Table 17 were evaluated for this research. This research adopted the multi-strategy design. An in-depth case study and a survey strategy were chosen as the most appropriate based on the nature of the research questions. The other strategies were not considered appropriate for two main reasons. First, a bigger sample size was needed which could be hectic and challenging to deal with qualitatively due to resource constraints. It could be difficult to deal with huge amount of data. Secondly, the research aims to determine strategic carbon management practices within universities, which could be difficult with any other strategy to provide in-depth insights, apart from a case study. This is supported by Saunders et al. (2009), who argue that research strategy is guided by the research question(s), the extent of existing knowledge, time and resources available and philosophical assumptions. The survey strategy addresses strategic carbon management in a quantitative way. The survey could balance both depth and width during the research. This could complement and validate the findings. However, it must be acknowledged that these research strategies should not be considered as being mutually exclusive and for example, it is possible to use survey strategy with case study (Saunders et al., 2009).

4.6.1. Case Study – De Montfort University (DMU)

"Case study is a research strategy which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence" (Robson, 2002, p. 178). A case study tends to be much more focused strategy and can explore a wide range of themes and subjects from a large number of people, organisations and contexts (Gray, 2004). This strategy is applied in various situations to contribute to the knowledge of individuals, organisations, groups and understand social, political and related phenomenon. This is considered the most challenging in all social science endeavours (Yin, 2009). Organisations are complex structures and people working in them are quite busy, making it difficult for researchers to gain access to data collection. Internal stakeholders within an organisation could have different agendas (Gray, 2004). However, there exists a supporting argument that if a case study strategy is relevant for a study, there is a need to combine the case study with the real world practice (Gill and Johnson, 1997). This could provide better insights into the process under investigation. Yin (2009) argues that case study strategy is preferred when 'how' or 'why' questions are posed and the researcher has little or no control over the events. A case study is not only suitable for investigating 'how and why' questions, but also suitable for developing and testing a theory and further refining it (Voss et al., 2002). There can be a single or multiple cases. As case study is well-suited to new topics where existing theory is inadequate in the literature (Eisenhardt, 1989) and this is the case with the current research topic of strategic carbon management in universities. Therefore, a case study strategy was adopted. Critical realism offers philosophical justification for a single case study and provides structured way of arguing for the generalisibility of the findings (Easton, 2010b). This is the research approach based on 'systematic combining' grounded in an 'abductive' logic (Dubois and Gadde, 1999). The identification of 'which

case to study' is a critical issue in any research (Dubois and Gadde, 2014). DMU was chosen as an in-depth case study to investigate how a university can implement SCM at an organisational level. The detailed justification of DMU case study is presented in Chapter 7.

There may be exceptional circumstances when a single case is unique or important that the researcher has no desire to generalise the findings to other cases (Yin, 2009). In order for an in-depth case study to provide insights into the phenomenon, it should be representative of a broad range of cases, which DMU is. Based on this fact, the typical case study approach is adopted. The typical case exemplifies typical values and provides some general understanding of a phenomenon (Gerring, 2007). A single case study can be selected because it is a typical case or it may provide an opportunity to observe change and analyse the phenomenon (Saunders et al., 2009). This research has adopted a single case strategy, because it is argued that a single case is good where it represents a critical, extreme or unique case. It is argued that "*learning from a particular case (conditioned by the environmental context) should be considered strength rather than a weakness. "The interaction between a phenomenon and its context is best understood through in-depth case studies"* (Dubois and Gadde, 2002, p. 554). However, *"studying a single case in detail does not guarantee that rich theoretical insights will be the harvest, of course, using multiple cases won't guarantee insights either"* (Dyer and Wilkin, 1991, p. 618). Dubois and Gadde (1999) believe that focus on a single case is the best way to emphasise the fundamentals of the case. In this study, the case for adopting a critical realist framework is further reinforced by the case study similar to that of (McEvoy and Richards, 2006). Therefore, what was previously regarded as a problem in regards to a case study is now recognized as an opportunity (Dubois and Gadde, 2002). Easton (2010) describes that critical realism provides a coherent, rigorous and novel philosophical stance to support the research process and theory development.

> *"Critical realism is a coherent, rigorous and novel philosophical position that not only substantiates case research as a research method, but also provides helpful implications for both theoretical development and research process"* (Easton, 2010a, p.118).

A case study strategy has some limitations. Opponents argue that a case study provides an 'unscientific' feel during the research (Saunders et al., 2003). In contrast, Flyvbjerg (2006, p. 219) examined five misunderstandings of the case study and one of them was *"one cannot generalize from a single case; therefore, the single-case study cannot contribute to scientific development"* He argued that this conventional wisdom is misleading. Yin (2009) explains that case studies are seen as a less desirable form of inquiry than either experiments or survey strategies perhaps, because of the greatest concern of lack of rigor in case study research. The researcher can, sometimes, be careless and unsystematic in following the procedures, or allow equivocal evidence or biased views to influence the research findings and conclusions. This lack of rigour is less likely to happen in other methods, possibly due to the existence of the various methodological procedures to be followed in the research (Yin, 2009). It is because case study as a research strategy is viewed as lacking rigour and objectivity,

when compared with other research methods (Rowley, 2002). The main argument against it have been that case studies provide little basis for scientific generalization of the findings (Yin, 1994). Yin (1994) concludes that case study is remarkably hard to conduct, in spite of the fact that it is considered a 'soft' approach. The researcher made informed decisions to address the case study concerns with a large number of case study interviews at different levels and triangulated approach of data collection. Contrary to this, case study is capable of creating thick descriptions and rich understandings of social contexts offering valuable research insights for public policy makers (Macpherson et al., 2000). Another limitation in conducting a case study is time; time that the researcher requires to access to the case investigation and the time that researcher has available to devote to it. This limitation can be overcome by getting involved with the case study sooner in the study. The correspondence needs to be maintained and good relationships should be developed for further queries as follow up. This could help in providing access to the right people (Coley, 2008). This was followed and good relationships were established with participants to ensure self-disclosure and confidentiality.

4.6.2. Survey

There is an argument against case studies for not being able to generalise the findings beyond a single case. One way to address this issue is to adopt a pragmatic approach of integrating qualitative and quantitative data and fusing them together in a multi-method study (Macpherson et al., 2000). Therefore, survey strategy can be adopted which can provide an emphasis on the representativeness of research findings through quantitative investigation. It is a widely used strategy in social sciences and management research. The main aim of carrying out a survey in empirical research is to achieve wide and inclusive coverage in order to obtain factual information (Denscombe, 2010). It is argued that *"when something is surveyed, it is 'viewed comprehensively and in detail' and the purpose of doing a survey is generally to 'obtain data for mapping'"* (Denscombe, 2010, p. 11). The first phase of the research adopts qualitative study of semi-structured interviews and content analysis. The second phase consists of a case study and a quantitative survey strategy. Kopinak (1999) found that qualitative data collected through the interviews and ethnographic observations verified the findings from a quantitative survey in a mixed-methods study of refugees' well-being. This triangulated approach makes sense from both a positivist and critical realist perspective and it is based on the assumption that there is a tangible social reality. The goal of confirmation makes less sense from an interpretivist philosophy. This research design supports the argument of conducting quantitative survey after the qualitative study.

The survey strategy brings the quantitative aspect into this study. This survey investigates the current state of strategic carbon management in the UK HE sector and ranks the drivers and barriers to strategic carbon management according to the level of their importance. The most common forms of surveys include self-administered postal surveys, telephone surveys and internet surveys (Robson, 2011). Denscombe (2010) argues that postal surveys are probably the best type of survey and it

involves sending self-completion questionnaires by post. However, it is considered expensive and time consuming with relatively low anticipated response rate. Telephone surveys are not effective for this research either, because of the large sample and associated costs. It would not have been possible to get the high response rate through telephone survey, as it seems quite difficult to target the right person. Based on the available resources and the research needs, an online internet survey was chosen. Internet surveys are cheap and fast alternative to the other types of surveys (Denscombe, 2010). As the internet is becoming part of everybody's daily life, this seems to be the most suitable option to collect data. All of the UK universities and managers working there have easy access to internet for completing the survey.

Survey has both advantages and disadvantages. The main advantages include collection of empirical data, mix of quantitative and qualitative data, wider geographical coverage, efficient and inexpensive way of collecting large set of data (Denscombe, 2010). In contrast, survey is not effective while researching sensitive and complicated matters, because surveys do not offer an opportunity to study issues in great detail and depth. There are risks of getting low response rate and tendency to focus more on the data than theory (Denscombe, 2010). This research did not face these issues, because of the lack of knowledge and the idea was to understand wider perspective of universities on strategic carbon management. The strategy was adopted to use the maximum benefits of survey, which seems to directly align with the research objectives. Gray (2004) adds that surveys offer an opportunity of simple data analysis and also suit to the potential respondents.

4.7. Research methods

Research methods are the tools and techniques for data collection (Bryman, 2004). Methods can involve instruments such as, questionnaires, interviews, participant observations and content analysis. In practice, certain research methods tend to be associated with specific research strategies, however, strategy does not dictate the selection of the research methods (Denscombe, 2010). Robson (2002) recommends that it is of use to stay within one research approach initially with the aim of becoming comfortable with it, learning it and keeping a study focused. The data were collected by employing multi-methods, both in the first and second phase of the research. Combining the multiple techniques in a case study strengthens and confirms the results obtained from this research (Noor, 2008). *"No single source has a complete advantage over all the others. In fact, the various sources are highly complementary, and a good case study will therefore want to use as many sources as possible"* (Yin, 2009, p.85). Critical realist researchers argue that the choice of data collection methods should be informed by the nature of the research (McEvoy and Richards, 2006). The methods employed in a case study may vary and might include questionnaires, interviews, observations, and analysis (Saunders et al., 2003).

4.7.1. Types of research methods

There are two types of research methods, quantitative and qualitative. Quantitative methods are linked to a process in which the design of the research study is fixed before the main stage of data collection starts (Robson, 2002). Quantitative research methods assume that everything in the social world can be described or measured with a number, but this does not assume way of dealing with it. This has statistical advantages as it allows large amount of data to be collected and analysed in a logical and replicable manner (McQueen and Knussen, 2002). This method is mainly used in laboratory and scientific situations. Bryman (2004) argues that quantitative methods often fail to distinguish between social institutions and people from the 'natural world'.

Qualitative research provides an in-depth investigation of the social world by learning about people's experiences, perspectives, circumstances and histories (Ritchie and Lewis, 2003). This research method provides insights into the research problem. Quantitative methods could give large general surface structure, whereas qualitative methods could give an in-depth picture to advance knowledge and understanding. Both of the methods are valuable, but have their disadvantages. However, there is an argument that one data source may be insufficient. Creswell and Clark (2011) argue that qualitative data could provide a detailed understanding of a research problem, while quantitative data could provide a more general understanding of the problem being studied. Qualitative and quantitative methods often provide different perspectives and each method has its limitations. The third paradigm, mixed-methods, combines quantitative and qualitative data to complement the disadvantages and limitations of both methods. Both types of data could address different aspects of the same study using different methods. Bryman (2004) observes the difference between the two methods.

	Quantitative	**Qualitative**
Principal orientation to the role of theory in relation to research	Deductive: testing of theory	Inductive: generation of theory
Epistemological orientation	Natural science model, in particular positivism	Interpretivism
Ontological orientation	Objectivism	Constructionism

Table 18: Differences between quantitative and qualitative methods (Bryman, 2004)

The same study can use mix of quantitative and qualitative methods for 'Triangulation'. "*Triangulation refers to the use of different data collection techniques within one study in order to ensure that the data are telling you what you think they are telling you*" (Saunders et al., 2009, p.146). Mixed methods research is supported by several authors (Ritchie and Lewis, 2003; Bryman, 2004; Denscombe, 2008; Saunders et al., 2009), who argue that there is considerable potential for mixed methods for optimising the strengths of the two approaches and it is advantageous to do so.

Quantitative and qualitative research methods can be employed to reveal different facets of the same reality and examine reality from different perspectives in the study (McEvoy and Richards, 2006). Mixed methods approach is recommended for understanding complex research issues, since no single approach can capture reality from all aspects. Dubois and Gadde (1999) support the argument that an important dimension of systematic combining is to make use of different data sources and methods that complement each other. Critical realism is compatible with the combination of quantitative and qualitative methods for a triangulated approach (McEvoy and Richards, 2006).

> *"The mixed methods approach can be seen as offering a third paradigm for social research through the way it combines quantitative and qualitative methodologies on the basis of pragmatism and a practice-driven need to mix methods"* (Denscombe, 2008, p.280).

Mixed methods approach was adopted based on the research objectives. The triangulated approach could help provide a rich understanding of SCM process in depth and width by employing different tools and techniques to collect data. The combination of qualitative and quantitative methods enables the research findings to be reinforced. The qualitative research aims to deal with qualitative factors around SCM in universities in general and DMU in particular. The quantitative aspect investigates SCM issues more widely from a larger sample of UK universities. Overall, data was collected through different methods and theoretical insights were produced in the form of a SCM framework. The qualitative study explored the current state of SCM from research participants' perspectives and experiences, understanding of its main drivers and barriers and the key features to embed it in a university, i.e. critical success factors. The quantitative study of the UK HE sector tests the provisional thematic framework for SCM.

Consequently, qualitative data are likely to be emergent in nature and complex, opposite to quantitative data. Therefore, a qualitative research approach provides the research with the flexibility to make required changes in the research design as and when required (Ritchie and Lewis, 2003). Some authors argue that qualitative and quantitative approaches are different in philosophical and methodological origins that they cannot be mixed in one study. In contrast, some believe that while recognising different ontological and epistemological stances, there can be real value in bringing the two approaches and data together (Ritchie and Lewis, 2003). Quantitative research is generally, though not exclusively, associated with positivist, deductive methodology, whilst qualitative research is commonly associated with constructivism. Methods are not linked exclusively to a specific research philosophy (McEvoy and Richards, 2006). However, neither of the approaches should be assumed to be superior over the other, nor they are mutually exclusive; increasingly, research strategies are multi-method (Bull, 2008).

4.7.2. Interviews

An interview is a conversation between people in which one person has the role of a researcher (Gray, 2004). It is a widely used research method in social sciences and management research. Interviews

could help gathering relevant and reliable data for research purposes. Interviews are insightful and targeted focusing directly on the research topic for perceived casual inferences and explanations (Yin, 2009). Interviews can be highly formalised and structured using standardised questions for each research participant, or they may be unstructured and informal (Saunders et al., 2003).

1. **Structured interviews:** These are used to collect data for quantitative study. Pre-prepared questionnaires and standardised questions are posed to respondents. The responses are recorded on standardised interview schedule and interaction between interviewer and respondent is minimized for more open-ended discussions such as non-directive interviews (Gray, 2004). This is similar to a questionnaire which is administered face-to-face (Denscombe, 2010).

2. **Semi-structured interviews:** Gray (2004) states that these are non-standardised interviews and are often used in qualitative studies. The interviewer has a list of predetermined questions or themes about a selected topic to be covered during the interview, but he or she might not deal with all of them in each interview. The order of the questions might also change depending on the interview's direction and emergent questions may be asked (Gray, 2004).

3. **Unstructured interviews:** These are informal in-depth interviews used to explore a particular topic. In unstructured interviews, there is no predetermined list of questions, but the interviewer needs to have a clear idea of what is needed to explore broadly, using open ended questions. The interviewee is given the opportunity to talk freely in a non-directive way and rich amount of qualitative data are obtained (Saunders et al., 2003). These are also referred as 'informant interviews' (Robson, 2002) and the emphasis is on the interviewee's thoughts and perspective on the chosen topic (Denscombe, 2010).

Semi-structured and unstructured interviews are non-standardised interviews (Saunders et al., 2003) and are widely used in flexible and qualitative research designs (Robson, 2002). In general, interviews provide an essential source of case study evidence, because case studies are about human affairs or behavioural events (Yin, 2009). Moreover, managers are more likely to prefer to be interviewed instead of completing a survey questionnaire, especially when the interview topic is interesting and relevant to their current position (Saunders et al., 2003). These three types of interviews were carefully evaluated and decision was made to mainly conduct semi-structured interviews in this study.

The current research has two phases. An exploratory research was carried out in the first phase of the research by using semi-structured interviews to develop a provisional thematic framework. This provisional thematic framework can be called a 'conceptual framework'. *"A conceptual framework explains either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables and the presumed relationships among them"* (Robson, 2011, p. 67). Robson (2011) argues that developing this type of framework helps the researcher to select and decide

important features to be focused on explicitly, informing the type of data to be collected and analysis. Semi-structured interviews were conducted in the first phase of the research including the two unstructured interviews to refine the focus of the research at the earlier stage. These two interviews were arranged with the Environmental and Sustainability Officer at DMU. These unstructured interviews helped in exploring the research domain and gather scoping information about the case.

Semi-structured interviews were held with university managers and other key individuals from the HE sector organisations. The HE sector organisations are not named due to ethical reasons. The interviews were conducted either face to face or by telephone, depending upon the location and time commitments of the interviewees. Financial resources were needed to travel to other universities; therefore, telephone interviews were also conducted. A list of questions relating to strategic carbon management was drawn up in response to the analysis of some HE documents, such as carbon management plans, HEFCE policies and strategies and the Carbon Trust documents, the initial unstructured interviews and also personal discussions with individuals working in this area. The context of the first phase interview research was English universities. In essence, the mix of both interviewing techniques, semi structured and unstructured, should give a good opportunity to investigate this under-developed area, where there seems to be no commonly agreed literature. Second phase interviews included the case study interviews with the middle and senior managers at DMU and four selected interviews with the key survey respondents. The members of the senior management team (Executive Board (EB)) were interviewed in the second phase case study to gain strategic insights into carbon management. Four survey respondents were interviewed for further clarifications. In contrast, it is believed that interviews are time consuming and resource intensive. It is difficult to analyse qualitative data generated by such interviews and ultimately, they may suffer from poor levels of reliability (Denscombe, 2010). In order to address these major issues, either telephonic interviews were conducted or they were based at DMU and no cost was involved. The researcher was flexible in terms of scheduling the venue and the duration. The time can impact on the willingness of the people to participate and the length of the interviews must be specified to the interviewees before the start and the interviewer is responsible to finish it in time (Robson, 2002).

Interviews can be biased from both interviewer and interviewee perspectives due to poorly designed questions and bias response respectively (Yin, 2009). Interviews offer problems for internal generalisability and reliability of research findings, because the researcher is usually with the research participant for a short period of time and must draw appropriate inferences (Huberman and Miles, 2002). This issue can be addressed by carrying out content analysis and participant observations in addition to interviews. This can help compare and verify results of the interviews through ‘triangulated approach’. For interview recording, various options are available. A digital recording

device and an iPhone were used. Hand written notes were also taken. All of the recordings were transcribed for the analysis.

4.7.3. Content analysis

Content analysis is a widely used research method that may be used with either qualitative or quantitative data and in an inductive or deductive way (Elo and Kyngas, 2007). Content analysis is a research technique for making replicable and valid inferences from the collected data to their context (Krippendorff, 1980). Qualitative content analysis makes subjective interpretations of the content of textual data through the systematic classification process of coding and then identifies themes of patterns (Zhang and Wildemuth, 2009). Content analysis of documents is a tool which provides knowledge, new insights, a representation of facts and a practical guide to the actions (Krippendorff, 1990). The observations and interviews help in getting the primary data, whereas content analysis provides a useful source of secondary data. The inferences from the documents must be valid and replicable, but it is suggested that one of the most significant factors is the context in which the inferences gained are to be used. The content analysis can involve working with art, images, maps, symbols, sounds, and numerical records as data in a research study (Krippendorff, 2004).

Content analysis was carried out to integrate the primary and secondary data to ensure the validity of the research. It is necessary to understand that what kind of content needs to be analysed using this method. The documents consist of first phase universities' carbon management plans and strategies and policy/strategy documents related to DMU. Almost all of the universities have carbon management strategies and plans, which are publicly available on their websites. Eighteen CMPs are analysed in the first phase. The case study also involves content analysis of DMU's CMP, strategies, policies, minutes of meetings and related documents. Thus, the content analysis is carried out for case study investigation and beyond at a sector level. This is supported by Saunders et al. (2003) as it is argued that within business and management research, secondary data are mostly used in case studies. Inductive content analysis is used in cases, where there are no previous studies dealing with the phenomenon (Elo and Kyngas, 2007). The same principle was applied to explore the SCM process in this research. As far as limitations are concerned, content analysis can be prone to researcher's bias due to its qualitative and subjective nature. Woodrum (1984) argues that since the contents of documents are analysed rather than the characteristics of the individuals or groups involved in the documents, therefore, the significance and interpretation of these findings is uncertain. Triangulation addresses this limitation of content analysis.

4.7.4. Observations

Observation is a key social sciences research method. It does not rely on what people say, they do or what they think. It offers more than that and draws on the direct and first-hand evidence of events (Denscombe, 2010). Observation as a method involves observation, recording, description, analysis and interpretation of people's behaviour (Saunders et al., 2003). It is a natural and obvious data

collection technique to watch what the research participants do, recording it and then describe, analyse and interpret the data generated from what has been actually observed (Robson, 2002). "*Observations during meetings and other events beyond the control of the researcher may contribute data that would not have appeared otherwise. The observations generate new questions on which further interviews can be based"* (Dubois and Gadde, 1999, p. 12). Table 19 illustrates types of observation techniques presented by Robson (2002).

Observation technique	Focus	Researcher's role
Naturalistic Observations	Behaviour in its natural environment	The researcher does not attempt to interfere with what is being observed
Controlled Observations	Unlike Natural Observation, the emphasis is not on the setting, but on the natural occurrence of the event	The researcher attempts to structure or influence the behaviour or response to be observed
Participant Observations	Processes occurring in particular groups	The researcher becomes a part of the 'thing' that is being observed

Table 19: Different types of observational study (Robson, 2002)

Saunders et al. (2003) divided observation into two categories, participant observation and structured observation (often called systematic observation). Participant observation is qualitative and derives from the work of social anthropology. Structured observation is quantitative and is more concerned with the frequency of actions. Observation is used as a main method in case study and to supplement the other methods (Saunders et al., 2003). The current research used participant observations in the case study. Participant observation offers a platform to gain rich insights and holistic explanations including the relationships between different factors involved in the study (Denscombe, 2010). It is a useful technique if you are working in the same organisation and it provides an easy access (Saunders et al., 2003). The Sustainable Development Task Force (SDTF), Environmental Champions, Green Impact, carbon management plan and strategic plan update meetings were observed. Gray (2004) mentioned that there are two approaches to observation, known as overt and covert observation. 'Overt observation' is where those being observed are aware of it and 'covert observation' is where they are not aware of the process. Overt observation approach was adopted for the SDTF meetings with the permission of the Chair and the researcher introduced himself to the participants. Covert observation is followed in other estates meetings such as Environmental Champions, Green Impact and other carbon management related meetings. This approach was adopted to gain better understanding of the current situation and issues around SCM. However, data are reported anonymously keeping in view the issues of consent and ethics associated with covert observation. Gray (2004) argues that covert approach raises ethical issues of not informing the participants, but this is addressed by keeping the participants' names anonymous. The best observational research is the one in which those that are being observed are not aware of it (Gross and Mcilveen, 1998).

The main issue was that there were not many relevant and planned meetings to attend. The SDTF meetings are arranged quarterly and they were observed for more than a year. Environmental and carbon management issues are discussed in these meetings. It was decided that the researcher will not take an active role in any of the meetings, particularly in the SDTF and will remain impartial to limit his influence on the participants' behaviour and actions. Observations developed an understanding of 'what is going on' in terms of strategic carbon management at wider organisation level. The schedule of meetings was provided with the minutes of previous meeting and agenda of the next meeting by the secretary. The participation in the SDTF helped in building relationship with members for conducting interviews. One of the issues concerning observations is the way in which data are recorded. There are various techniques for recording the data. None of the recording devices were used during this study and hand notes were taken. The formal minutes and documents of the meetings were combined with the notes to build up a comprehensive picture of each meeting. Denscombe (2010) mentioned that access, commitment, reliability, generalisation of the data and deception are the main disadvantages of the participant observation. Access and commitment was not an issue being a DMU student. Furthermore, the data was triangulated with other methods to address these issues (Gray, 2004).

Saunders et al. (2009) state that observation research can have two types of bias, participant bias and observer bias. If you are a known researcher and people are aware of the observation, then there is a chance that participants might change behaviour to give a positive image and avoid the facts which can significantly affect the results. A long term participation in the meetings can decrease the impact of this bias. There is a risk of observer bias as the relationship is developed between the observer and participants, because of the substantial amount of time. There are chances that the observer can lose critical approach for analysis. Gill and Johnson (1997) developed four categories of the roles the participant observer can adopt and these are named as complete participant, complete observer, observer as participant and participant as observer. This research adopted 'participant as observer' role in most of the meetings, where the purpose of participation was revealed with brief introduction to the participants. 'Observer as participant' role was adopted for the Environmental Champions, Green Impact and CMP update meetings.

4.7.5. Questionnaire

Questionnaire is a data collection method for the purpose of a survey to collect information directly from the research participants through a written list of questions (Denscombe, 2010). There are different types of questionnaire being used in research as part of a survey strategy. The two main types of questionnaires are postal type and internet type. Questionnaires can be used to gather standardised data from a large number of respondents in a wide geographical area to get brief and uncontroversial information (Denscombe, 2010). The data can be collected in a short period of time in a relatively cost effective way. *"Survey questionnaires are research tools through which people are asked to respond to the same set of questions in a predetermined order"* (Gray, 2004, p.187). As part

of the survey strategy in this study, data was collected through the questionnaire within the UK HE sector. The respondents were middle and senior managers working in the environmental team within estates department and other university departments.

The survey questionnaire was designed based on the first phase 'integrative framework' for strategic carbon management (see Figure 24). The questionnaire was carefully designed linking with the research objectives. The questionnaire was mainly quantitative, but an open ended question was designed at the end and many of the questions had also open ended optional 'comment' sections. The UK HE sector was the research sample for the current study. The decision about sample size is not easy and depends on a number of considerations and it has no specific answer (Bryman, 2004). A web based tool, SurveyMonkey, was used to develop an online survey. This is a user friendly tool and helps in customizing the survey questions, distributing the questionnaire and collecting the responses (SurveyMonkey, 2015).

After the design, a pilot study was conducted by sending the online survey to the three Environmental Managers in three different universities from the first phase sample. A pilot study is a small-scale version of the real thing, a try-out of what you propose so that its feasibility can be checked (Robson, 2011). The survey was also sent to two of the colleagues in the IESD to review the design and provide the necessary feedback. The supervision team reviewed the questionnaire and it was further revised to address their comments and feedback, so that the survey study meets the research purpose. The sample universities were targeted in such a way that there was no university left in the UK, where member/s of the environmental team did not receive the questionnaire. Some of the universities were also contacted individually via emails taken from their websites and specific respondents were requested to complete the survey. The web link was sent to the potential respondents with the help of the Environmental Association of Universities and Colleges' (EAUC), the Association of Directors of Estates' (AUDE) and the Association of University Engineers' (AUE) mailing lists. The Carbon Trust Public Sector Network, social media, including Linkedin and Twitter, personal contacts and the contacts obtained from university websites were utilised. The responses were requested from individuals in UK universities mainly.

4.7.6. Social media and personal communications

There has been wide scale adaptation of social media tools among researchers for a range of purposes (Minocha and Petre, 2012). Social media, professional networking groups and forums such as the Carbon Trust and the EAUC, the Guardian live chats and personal email contacts are also utilised to feed into both phases of the research. Social media is one of the most popular tools being used by researchers (Yimei and Rob, 2012). Direct messages were sent to carbon management practitioners within the UK HE sector, particularly to potential survey respondents to explore relevant issues with more depth. LinkedIn groups ('Sustainability in University & Colleges International' and 'University

& College Estates & Facilities Professionals') were used by posting questions related to the research and significant numbers of responses are obtained from the group members. This strategy serves the purpose of clarification of emerging questions related to certain themes. It can also offer depth with further questions and answers. The data was then fed into the interviews, survey and case study. It was free of cost and could be the most efficient tool to collect latest information.

Two Guardian live chats were also joined and relevant questions were asked from the panel members and the peers. These chats were related to the research topic and useful information was collected. LinkedIn was used initially to get the early feedback on the research ideas and the research design. It helped in recruiting the participants for the survey study. The Carbon Trust's Public Sector Carbon Network and the EAUC discussion forums were joined to debate around the topic of strategic carbon management, but, unfortunately, the response of the participants was very low. LinkedIn and these forums were also used to disseminate the survey. Twitter was also used to spread the message in the sector. Social media tools such as Twitter and Facebook are among popular tools used by doctoral researchers (Zhu and Procter, 2012). The majority of universities have Twitter accounts for communicating environmental and sustainability issues. The researcher used his personal Twitter account to send the online web link to the survey with a brief message, requesting participants to complete it. Almost all of them responded to the request and completed the questionnaire. Personal communications with practitioners and other key individuals from the HE organisations were also useful to get information on the emergent issues. Emails, social media, conferences, telephone and face-to-face informal conversations were quite useful to feed into the data. In addition, the researcher attended a range of conferences and events, so anything which was relevant and could feed into any of the themes, was included in the analysis to bring another perspective.

4.8. Data analysis

The research objectives shaped the data analysis techniques. The research collected qualitative and quantitative data. The software packages NVivo 10 and SPSS 20 were used for analysing the qualitative and quantitative data respectively. NVivo is a software tool which enables researchers to collect, organize and analyse the data from interviews, focus groups discussions, surveys, social media, webpages, audio and videos (QSR International, 2014). In this study, Nvivo helped in thematic analysis, particularly for the interviews and content analysis. SPSS 20 was used for statistical analysis of the quantitative data collected through the HE sector survey. The quantitative analysis was carried out without going into complex statistical analysis, because it was beyond the scope of the study. The data collected through the conversational interviews may be difficult to analyse, because different questions have been asked to different people. However, it is managed after going through the data to find emerging patterns or themes (Gray, 2004). Thematic analysis helps organising and describing the data in detail often going further and interpreting various aspects of the study (Boyatzis, 1998). Thematic analysis is poorly demarcated and rarely-acknowledged in the literature, but widely-used

and flexible qualitative method. There is no clear agreement on what thematic analysis actually is and how is it carried out (Braun and Clarke, 2006). This is the main approach applied for the qualitative analysis to answer the research objectives. Data obtained from social media, professional networking groups and forums, live chats and personal communications was analysed manually because of less volume of data.

4.9. Credibility of the research

It is recognised that predominantly the qualitative and subjective nature of the research poses doubts for credibility of the findings. The element of credibility is of particular importance for the case study, because of the reliance on data that is generated from either limited or particular samples (Gray, 2004). In order to reduce the possibility of getting the research findings wrong, attention has to be paid to two particular characteristics of research design, reliability and validity (Saunders et al., 2003). Validity and reliability are the two criteria to evaluate the quality of any research.

4.9.1. Validity, reliability and generalisation

Validity means that the data collection instrument must measure what it was actually intended to measure (Gray, 2004). Validity is concerned with whether the research findings are really about what they appear to be about (Saunders et al., 2003). In broader terms, validity means that the data and the methods used are correct and the notion of validity centres on whether or not the data reflects the reality, truth and covers all of the crucial matters of the topic (Denscombe, 2010). Most of the challenges related to the validity of the findings are linked with the biases during the research process (Coley, 2008). It was intended to enhance the accuracy of the data collection process by applying multi-methods approach, triangulation, in the case study and beyond as well as mixed-methods approach to the overall research design, so that it reflects the true research findings. Triangulation of data is argued to reduce the threat of the researcher's and respondent's bias and therefore it increases the validity of findings (Robson, 2002). Triangulation is an attempt to counteract the biases associated with a single method. Mixed methods can support robust conclusions (McEvoy and Richards, 2006).

Reliability indicates that if another researcher follows the same research procedures as carried out by an earlier researcher and carries out the same case study again, the later researcher should be able to explore the similar results and conclusions (Yin, 2003). In real world research and social science more generally, attempts to replicate the research are rare. Some researchers using qualitative methods consider it impossible and each study is essentially unique to them. So it is not feasible to repeat a study exactly with the same people in the same situation (Robson, 2011). Robson (2002) suggests that there are unforeseen chances of complications in qualitative data collection process and transcription, which include equipment failure, environmental distractions and interruptions, and transcription errors. The purpose of reliability is to minimise errors and biases. Yin (2009) argues that detailed documentation of the procedures adopted in case study research can help ensure that others can replicate and produce similar results. An auditor can produce the same results by following the same

procedures to perform a reliability check and it can confirm the evidence of reliability (Yin, 2003). Following Yin (2009), the record of everything was kept and the tactics offered by the previous researchers were followed to enhance the credibility.

External validity (generalisation) deals with the problem of knowing whether the research findings are generalisable to wider audience beyond the immediate case study (Yin, 2009). It is important to be aware of the major issues in the case study research in relation to issues such as external validity and generalisation (Bryman, 2004). It is not necessary that the findings from one study may help in understanding other cases. Case study cannot be used to generalise up to a wider population in the same way that is possible, for example, through a randomly chosen population in survey research (Yin, 2009). Therefore, Yin (2003) suggests that it is useful to identify other cases to which the results are generalisable. Contrary, Dyer and Wilkins (1991) advocate 'deep case studies' rather than 'surface case studies'. The main argument is that there is need of better stories than better constructs. One reason for this choice is that multiple case studies have been dealt with at length elsewhere (Yin 1994; Eisenhardt 1989; Miles and Huberman 1994). This study has adopted a single case strategy (DMU) and this is supported by Dubois and Gadde (1999) who argue that depth should be given priority than breadth. It is their belief that a focus on single case is the best way to emphasize the particular fundamentals of a case study. In this research, it is a matter of depth and breadth. As far as breadth is concerned, this study involves the quantitative survey and the qualitative study of UK universities. This triangulated approach could help in generalisation of the findings that may be of relevance to the whole HE sector and beyond. However, case study research can provide 'generalisations to theory', meaning theoretical explanations of the data observed, which may be applicable in similar cases where similar conditions prevail (Yin, 2009).

4.10. Ethical considerations

It is vital to give thought to the ethical aspects of what a researcher is proposing (Robson, 2011). Social researchers are expected to carry out research tasks in ethical manners (Denscombe, 2010). An application to gain ethical approval was submitted to the Faculty of Technology at DMU prior to the research and the approval was gained. This process identified the key ethical issues and a strategy for addressing them. The survey and the interview questions were approved from the 'Ethics Committees' prior to the study. The information sheet (see Appendix 1) was provided to the research participants giving details about the purpose of the research, research team and data protection procedures. It was ensured that any information given by the participants will only be used for the PhD study and will not be shared with other parties. The 'consent form' (see Appendix 2) was signed by the researcher and the participant to get the consensus. A copy of the consent form was provided to the participants.

Participation in the study was entirely voluntary and the participants could withdraw from the study at any time without prejudice or negative consequences. As far as 'data protection' is concerned, all of the data collected and processed in this study was handled in compliance with the Data Protection Act 1998. All information was anonymised and stored in a secure location. The names of the research participants were not declared anywhere including publications, and reports. Information, if published, was in aggregated form or associated with a code if the comments are insightful for anonymity. Necessary precautionary measures were taken to ensure that respondents are not harmed or adversely affected because of their participation in this study. Participants were also informed about audio recording prior to interviews and permission was granted in all cases.

4.11. Conclusion

This chapter presents the research design with the best possible methodological decisions made. Even though, there is no single way to conduct good research, there are always options and alternatives available (Denscombe, 2010). This thesis presents the real world and applied research seeking to explore SCM in the UK HE sector. Organisational research is not easy, however, there is no single subject called 'organisational research'. It draws upon fields such as sociology, philosophy, anthropology, economics, communication and statistics (Gray, 2004). Applied research is concerned with using the knowledge acquired through the research to contribute directly to the understanding of a contemporary issue (Ritchie and Lewis, 2003). Real world research is focused on solving problems and is concerned with actionable factors where changes are feasible (Robson, 2011). This type of research tends to be related to change within organisations and informs policy issues. Its focus is different from pure academic research, which aims to develop and extend a particular academic discipline (Robson, 2011). There are many books on research methodology available for researchers and sometimes, it can be difficult in understanding different terms and making decisions due to the complexity. There seem to be no universal agreements on the methodological concepts. The phases of the research are summarised in Figure 22 and summary of the methodology is presented in Table 20.

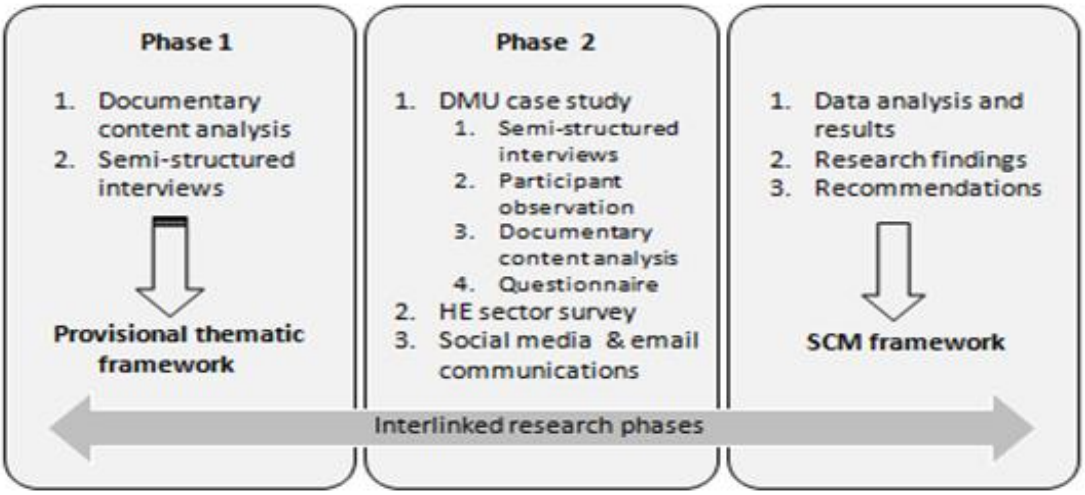

Figure 22: Phases of the research

Research Objectives	Research Methods	Chapters
1. To analyse the global, EU and UK policy landscape around climate change and carbon management and its implications for the UK HE sector.	Desktop study/background research Literature review Content analysis Personal communications	2. Universities and rise of carbon: Policy and historical context 3. Research Issues and theoretical background 4. Research methodology
2. To assess university levels of compliance and adoption of the latest carbon management policies and explore the current state of strategic carbon management in HE. 3. To explore the drivers for and barriers to strategic carbon management within the HE sector.	Content analysis Interviews Survey Social media and personal communications	5. Strategic carbon management: State of the UK Higher Education sector 6. Drivers and barriers to strategic carbon management
4. To identify critical success factors for effectively implementing and embedding strategic carbon management in universities.	DMU case study Interviews Content analysis Survey Participant observations Personal communications and social media	7. Strategic carbon management at De Montfort University: A case study
5. To develop a best practice framework for strategic carbon management and recommendations for HE and other public sector organisations.	Data analysis	8. Strategic or Pragmatic? A framework for Strategic Carbon Management (SCM)

Table 20: Summary of research methodology

Chapter 5: Strategic carbon management – State of the UK Higher Education sector

5.1. Introduction

The starting point of this research is to find out how universities are performing with regards to their carbon reduction targets and policy compliance. To do this, a content analysis of universities' carbon management plans (CMPs) was undertaken alongside a survey of the UK higher education (HE) sector. A carbon management plan is a document designed to assist organisations in reducing their carbon emissions and saving money on energy costs (Resource Efficient Scotland, 2016). CMPs present an official position of universities on how they are planning to implement carbon management strategies. Therefore, this chapter explores the current state of strategic carbon management (SCM) and assesses levels of policy adoption and compliance. The content analysis and survey helps inform the wider understanding of SCM within HE. The content analysis produced themes and sub-themes exploring the key elements of carbon management planning process. This chapter contains a section on the thematic framework, developed as part of the content analysis in the first phase of this research. This thematic framework in combination with the interviews analysis framework (next Chapter 6) was applied in the survey as a measurement tool to assess the SCM practices in the second phase. Finally, this chapter includes a discussion of the key results and conclusions are drawn.

5.2. The content analysis

A content analysis of the sample of eighteen universities' CMPs was carried out. The majority of the universities (eight) are from East Midlands region in England and five were selected from other groups and regions in the UK to make a representative sample. Two universities are from Scotland, two from Wales and one from Northern Ireland. Among these, five universities belong to the Russell Group of UK universities and thirteen are from other post and pre-1992 universities. Carbon management plans and strategies[3] were chosen for the analysis, as this is the only document that addresses the issue of carbon emissions. While these universities also have other types of carbon related strategies and policies such as sustainability strategies, travel plans, energy policies and procurement policies, detailed analysis of these documents falls outside the scope of this study. Out of the total eighteen CMPs, the plans of the sixteen universities are available on their websites. There are two universities that do not have CMPs publicly available on the website. One of them has put a summary of the CMP and the other has placed it on the corporate website, but it is only available on

[3] In this chapter, the terms carbon management plans, strategies and implementation plans are used interchangeably, as universities have given different names to their carbon management documents.

staff web pages. Table 21 presents the names of the eighteen universities with the titles of their carbon management documents. Two universities have given different names to their documents for their own branding.

No.	Name of the University	Name of the Document	Year
1	De Montfort University	Carbon Management Plan	2011
2	University of Leicester	Strategy and Implementation Plan	2007
3	Loughborough University	Carbon Management Plan	2010
4	Nottingham Trent University	Strategy and Implementation Plan	2008
5	University of Derby	Carbon Management Plan	2009
6	The University of Northampton	Carbon Management Plan	2011
7	University of East Anglia	Carbon Reduction Plan	2012
8	University of Cambridge	Carbon Management Plan	2010
9	Leeds Beckett University	Carbon Management Strategy	2012
10	University of Lincoln	Carbon Management Plan	2011
11	University of Nottingham	Carbon Management Plan	2010
12	University of Birmingham	Carbon Management Implementation Plan	2010
13	University of Bradford	Ecoversity - One Planet Strategy	2011
14	The University of Edinburgh	Climate Action Plan	2010
15	Heriot-Watt University	Carbon Management Plan	2009
16	Cardiff University	Carbon Management Plan	2013
17	Aberystwyth University	Implementation Plan	2007
18	Queen's University Belfast	Carbon Management Plan	2013

Table 21: Demographic information of universities

CMPs were analysed to feed into and meet the research objectives, as detailed in Section 1.3. They were systematically reviewed and the most relevant text was transferred to Microsoft Word documents, which were then transferred to NVivo 10 for thematic analysis. The qualitative data was coded under the themes and sub-themes for systematic analysis.

5.3. The Survey

A survey (see Appendix 5) was carried out with the help of an online questionnaire in the UK HE sector to investigate the current state of strategic carbon management and assess university levels of compliance and adoption of the carbon management policies. The underlying conceptual framework for the survey was the thematic framework for SCM which was developed in the first phase of the research. The two frameworks developed as a result of the content analysis of the UK universities' carbon management plans (see Appendix 4) and the interviews analysis in Chapter 6 (see Figure 28) were combined and modified to produce the survey framework, as presented in Figure 24. The survey

questions were designed based on these themes and sub-themes to be tested in this study. The approach of conducting a qualitative study and then integrating with quantitative study aligns with the work carried out by Strauss and Corbin (1998). The questions were also designed with the help of the Carbon Trust diagnostic tool for carbon management and the self-assessment questions for higher education institutions (HEIs) available in the 'Carbon Management Strategies and Plans: A guide to good practice' (HEFCE, 2010a). The quantitative questions included multiple choice and five Likert scale questions. The qualitative questions in the survey focussed on managers' opinions and were open-ended. The survey also included a section on 'demographic information'. The questionnaire went through a couple of iterations to ensure it is short and focused because unimportant issues may be eliminated before the study is started (Vanek, 2013). The supervision team reviewed the questionnaire and it was revised. A pilot study was conducted by sending the survey to three managers including Environmental Manager, Sustainability Manager and an Environmental and Sustainability Officer in three universities.

The final draft of the survey was online from August 2013 to September 2013. The survey was designed using the Survey Monkey tool and disseminated with the help of the EAUC JISCMail list, the EAUC Carbon Intensive Research Universities and Colleges 'Community of Practice' mailing list, the Association of University Directors of Estates (AUDE), the Association of University Engineers (AUE), the London Universities Environmental Group (LUEG) mailing lists, the Carbon Trust's Public Sector Carbon Network and social media (LinkedIn, Twitter, Facebook). Personal contacts were also utilised. The potential respondents were contacted through emails, direct messages and telephone calls and in total over 110 university managers were targeted through direct emails that included a request to pass the survey onto anyone else that might be interested in completing the survey. Two reminders were sent and the survey was closed on 01 October, 2013.

A total of 135 responses were received from 68 UK universities. There were 24 incomplete questionnaires and 15 of which were used in the analysis, as they contained significant amount of useful data. 9 responses were discarded where respondents had only given demographic details or less. In total, 126 responses were considered for analysis including 8 Further and Higher Education (FHE) colleges. The responses from these colleges were considered based on the quality of the data. 20 universities have more than one respondent and 48 universities provided single response. 9 responses were collected from the DMU case study. The detailed demographic information is presented in Appendix 8. Following the survey, four managers from Russell Group universities were contacted via telephone either to clarify emergent issues or for further exploration. Overall, the response rate was considered satisfactory. The data was transferred from Survey Monkey to Microsoft Excel 2010 for cleaning, sorting and modifying to remove missing values, irregularities and any other mistakes. The cleaned data were then transferred into the SPSS for analysis and to generate findings.

The subsequent sections present the results of descriptive statistics based on the variables used to measure SCM practices in universities. Correlations between key variables and group differences between pre-92 and post-92 universities were also calculated (see Appendix 9). The difference between these two types of groups of universities is discussed in Appendix 8.

5.4. Policies and plans

This section presents the results of questions pertaining to carbon management policies and plans and assesses the universities' levels of compliance and adoption of policies. Then, the current state of nation is investigated by following the same structure as that of the themes of the integrative framework for SCM (see Figure 24).

5.4.1. Low carbon or energy policy

This question explores if universities have a publicly available low carbon or energy policy. Each of the 126 respondents answered this question. The majority of the respondents (84.1%)[4] reported that their universities have a publicly available low carbon or energy policy, whereas only 5.6 % of the respondents stated their universities do not have it. Ten universities (7.9%) indicated their low carbon or energy policy is still 'under development' and three respondents (2.4%) were not even aware if their institution had either of the policies in place or not. Four respondents stated that their low carbon or energy policy is part of their CMP and does not exist separately. Similarly, three respondents stated that their low carbon/energy policy is part of the environmental policy. Three respondents mentioned the need to revise the policy, as it was out of date. Overall, the majority of the low carbon or energy policies are publicly available, but two respondents mentioned that their policy is not publicly available. One of them clarified that it is available to staff and students only and the other stated that it is available only on the university intranet pages.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	106	84.1	84.1	84.1
	No	7	5.6	5.6	89.7
	Under development	10	7.9	7.9	97.6
	Don't know	3	2.4	2.4	100.0
	Total	126	100.0	100.0	

Table 22: Low carbon or energy policy in universities

[4] 'Valid' represents the total number of respondents answering the question and 'missing' shows the number of respondents not answering it. The descriptive statistical analysis gives two types of percentages, 'Percent' and 'Valid Percent' respectively. The 'Percent' column represents the percentage of the cases including missing cases, constituted by each category and the 'Valid Percent' represents the percentage of non-missing cases which fall into each category (Pallant, 2007). This analysis is focused on 'Valid Percent'.

5.4.2. Carbon management plans (CMPs)

This question explores the development of a carbon management plan (CMP) in UK universities. Each of the 126 respondents answered this question with 91.3% of respondents reporting that their university has a publicly available CMP to guide carbon management. Only 6.3% reported that their CMP is 'under development', which is not common in most of the universities. Thus, the majority of the universities have CMPs in place, and this may be due to the HEFCE's influence.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	115	91.3	91.3	91.3
	No	2	1.6	1.6	92.9
	Under development	8	6.3	6.3	99.2
	Don't know	1	.8	.8	100.0
	Total	126	100.0	100.0	

Table 23: Carbon management plan in universities

CMPs are a major step forward in the HE sector towards the planning process. The majority of the universities' CMPs are publicly available to aid stakeholder involvement. However, two of the respondents stated that their CMPs are not publicly available. Four of the respondents stated that CMPs were being updated to incorporate relevant changes. An Environmental Manager at a post-92 university stated that the university had a CMP, but it needs to be revised.

> *"We had a comprehensive CMP, but the property strategy of the university has changed significantly and we need to revisit it"* [Environmental Manager]

Effectiveness of CMPs

The respondents were asked about the overall effectiveness of CMPs on a five Likert scale, based on their experience while working in universities. More than half of the respondents (50.9% agree and 8% strongly agree) (N = 112) think that CMPs have been effective in reducing carbon emissions year on year suggesting that CMPs are beneficial for reducing carbon emissions in the sector. Despite having some issues associated with them, CMPs seem to be effective, as identified in the first phase of the research. In contrast, 22.3% of the respondents neither agree nor disagree and 15.2% disagree on the effectiveness of CMPs. This indicates some gaps associated with CMPs, as discussed in the plans.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.7	2.7
	Disagree	17	13.5	15.2	17.9
	Neither agree nor disagree	25	19.8	22.3	40.2
	Agree	57	45.2	50.9	91.1
	Strongly agree	9	7.1	8.0	99.1
	Don't know	1	.8	.9	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 24: Effectiveness of carbon management plans

5.4.3. Environmental policies

The respondents were asked to tick the other environmental policies that were developed in their universities and are linked with carbon management. These strategies are not standalone and are part of carbon management strategy. The idea was to investigate universities' carbon management approaches in an integrated way, considering various streams of emissions, and to explore which areas of carbon management universities might be focussing on. Almost all of the respondents answered this question and some of them mentioned policies which were not included in the list. Following are the key environmental policies which were investigated.

Environmental policy: An Environmental policy demonstrates universities' commitment to reduce environmental impact. 88.9% of the respondents reported that their universities have an overarching environmental policy addressing environmental issues and 11.1% reported that their universities did not yet have this policy. This suggests that overall universities are concerned with carbon management at a policy level through the development of the wider environmental policy.

Sustainability policy: 65.9% of the respondents ticked the option of sustainability policy, indicating they have developed a sustainability policy and are implementing sustainable development. In contrast, 34.1% of universities do not have a sustainability policy. There appears to be no clear distinction between environmental policy and sustainability policy as some universities use the terms interchangeably. There are universities that have even developed 'environmental sustainability policy' (or environmental and sustainability policy) to address the same purpose. One respondent made this argument and stated that the environmental and sustainability policy are one and the same thing and it is called an 'Environmental Sustainability Policy'. This suggests that there is no clarity between the terms in policy arena within universities. Different universities use different terms to address environment and sustainability related issues. The responses indicate that individuals understand the terms 'sustainability', 'environment' and 'carbon management' and translate into actions.

Sustainable procurement policy: The respondents were asked to explore whether carbon management is integrated into procurement and decision-making process. The majority (64.3%) of the respondents reported that their universities have sustainable procurement policy. This is the first step to have a policy in place which could help address indirect scope 3 carbon management. The content analysis of CMPs identified that universities are not focused on scope 3 carbon management (procurement is part of that) and they have not measured these emissions and there are no scope 3 targets. Therefore, sustainable procurement or low carbon procurement policy is the starting point. On the other hand, 35.7% of the respondents did not tick this option, which means universities have not developed this policy yet.

Waste management policy: 69.6% of the survey respondents stated that their university has a waste management policy and 30.4% respondents stated that they do not. These statistics indicate that

waste is an area that universities are concentrating on more than other scope 3 areas. This policy aims to contribute to indirect scope 3 carbon management.

Travel policy: 75.4% of the respondents indicated having a travel policy in their institutions. This indicates that a large number of UK universities have developed travel policy to support sustainable modes of travel and reduce scope 3 carbon emissions. 24.6% of the respondents indicated that their universities do not have travel policy. The content analysis found that the majority of the universities have considered management of travel related emissions in their CMPs despite the fact that universities are not comprehensively focused on some parts of travel. There were two respondents who indicated that their universities have a 'Travel Plan' instead of a travel policy.

Biodiversity policy: Universities have now started to develop biodiversity policies and action plans. The final policy question was on having a biodiversity policy. 50.8% of the respondents reported that the university has a biodiversity policy in place to enhance biodiversity on campus and 49.2% of the respondents indicated that they do not this. Biodiversity has not received much attention in regard to carbon management, may be due to its indirect impact.

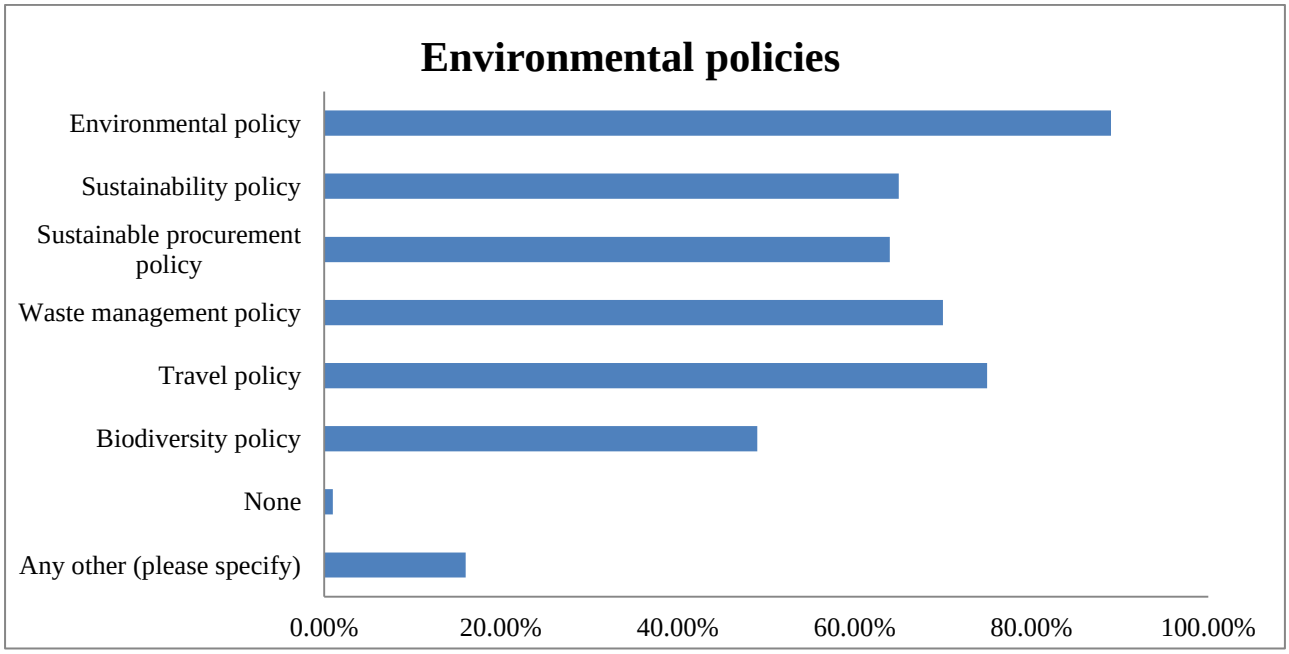

Figure 23: Key environmental policies in universities

The respondents were asked to specify if their universities have 'any other' policy. Eleven respondents mentioned 'Sustainable Food Policy', nine respondents mentioned 'Fairtrade Policy' and four mentioned 'Ethical Investment Policy'. This indicates that universities have a broad range of policies that address environment, sustainability and carbon related issues. The management of most of these policies is located within estates departments. The Sustainability and Environmental Advisor at a pre-92 university stated that the university has an 'Environmental Policy' covering all areas of emissions. Therefore, the university does not have separate policies.

5.5. Carbon management strategies

This section analyses the carbon management strategies to respond to the policies and plans. The majority of the universities has measured carbon emissions from their business activities and has set reduction targets. The next step for universities is to develop strategies to meet those targets. A question related to carbon management strategies in scope 1, 2 and 3 areas was included in the survey to investigate the type of strategies. The detailed result of the carbon management strategies in different areas is presented in Table 25.

Strategy areas	Yes	No	Don't know
Buildings Energy	97.37%	2.63%	0.00%
Own transport fleet	63.06%	34.23%	2.70%
Procurement and supply chain	42.20%	48.62%	9.17%
Waste	78.76%	18.58%	2.65%
Water	64.29%	30.36%	6.25%
Staff and student commute	62.16%	34.23%	3.60%
International students travel	12.84%	75.23%	11.93%
UK students travel	23.64%	62.73%	13.64%
Visitors travel	13.89%	70.37%	15.74%
Business travel	40.18%	49.11%	10.71%

Table 25: Carbon management strategy areas

The majority of the respondents (97.37%) reported that their universities have carbon management strategies related to buildings energy use and 63.06% stated that strategies for own transport fleet are developed. This suggests that majority of the universities have strategies for scope 1 and 2 areas, because they have measured these emissions. As far as scope 3 strategies are concerned, the majority of the respondents, 78.76% and 64.29%, reported that universities have strategies for waste and water respectively. This aligns with the findings of the content analysis reporting that waste and water are the parts of scope 3 on which universities are working. 62.16% respondents reported that their universities have developed strategies for staff and student commute. However, the majority of the universities do not have carbon management strategies related to international students travel, visitors travel and UK students travel. These elements of scope 3 are overlooked because 75.23%, 70.37% and 62.73% of the respondents reported that their universities do not have strategies for international students' travel, visitors' travel and the UK students' travel respectively.

> *"We have measured carbon values in each of these areas. With respect to targets, the one for international student travel is surely for HE to grow this, as in grow international recruitment. It would not be in the business interests of the university to reduce this and hence reduce numbers here"* [Head of Environmental Strategy]

The above quotation indicates that the university has measured and set targets for all of the areas, but reducing emissions associated with international student recruitment will not be beneficial for the business. This suggests tensions between the core business and reducing emissions due to international student travel. 40.18% of the respondents reported that universities have developed strategies to address emissions from business travel. In contrast, 49.11% stated that they do not have these strategies. The survey findings suggest that universities have started to manage business travel emissions. Five universities do not have specific carbon management strategies, but they have a strategy or plan to address emissions related to these areas.

> *"We do not have separate carbon reduction strategies for each of these areas. Most of the areas you mention are included within our current carbon management plan"* [Environmental and Sustainability Officer]

Carbon management strategies for procurement and supply chain are reported by 42.20% respondents indicating that universities are in the developmental stage of scope 3 strategies. In contrast, 48.62% reported that they do not have strategies to reduce procurement and supply chain emissions. The Research Fellow at a post-92 university commented on a lack of integration of carbon management strategies into procurement process and decision-making.

> ***"****Although GHG emissions from procurement and other sources have been measured for several years, I think carbon management has not been integrated fully in the procurement process and decision-making. It may be considered in some areas, such as energy, but it is not transparent in the procurement of construction works, IT equipment, etc. considered environmental aspects (such as energy efficiency, low carbon materials, etc.)"* [Research Fellow]

In order to investigate the current state of the UK HE sector, the following framework was applied in the survey. The integration of survey results and the content analysis is presented in the following structure as that of Figure 24 (from left to right) as a guideline.

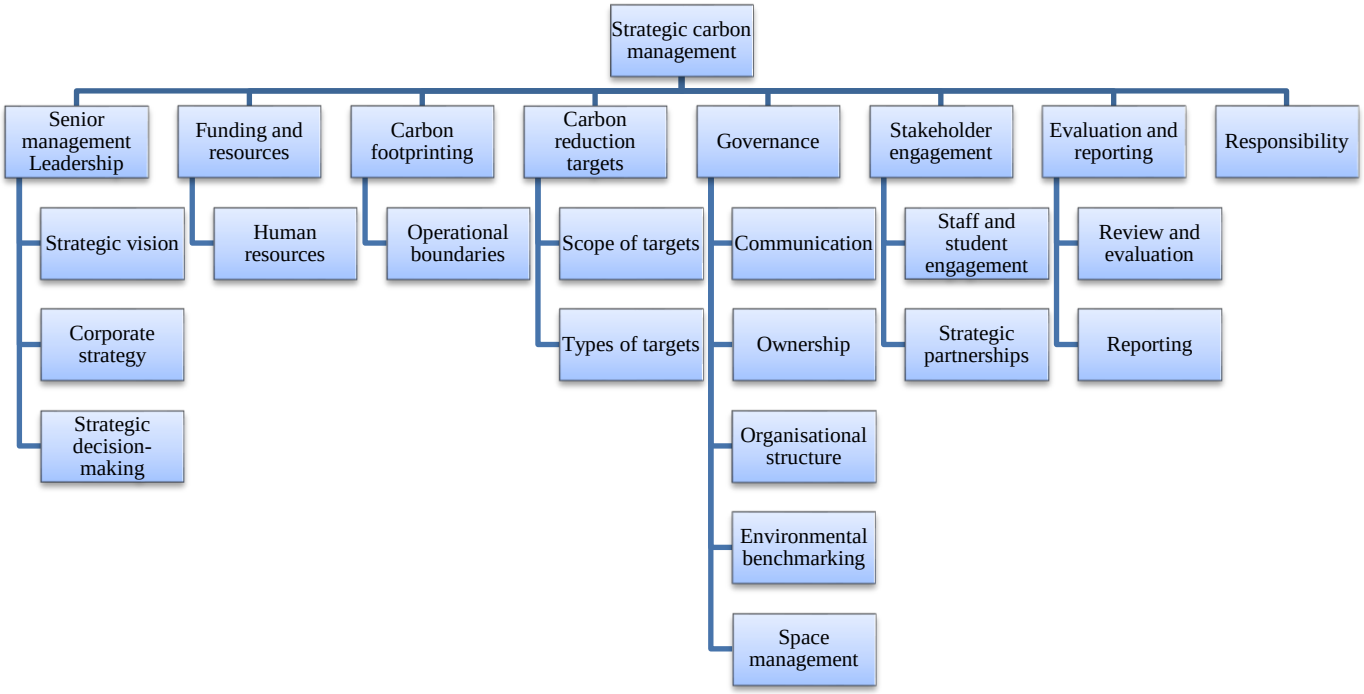

Figure 24: Integrative framework for survey

5.6. Senior management leadership

This theme explores the role of senior management leadership[5] in universities and the extent to which senior management is engaged in carbon management process. The CMPs of eight, out of the eighteen, universities have mentioned senior management commitment and their role in universities. In the survey, university managers were asked if the senior management leadership is fully committed to carbon management agenda based on their experiences. Surprisingly, the majority of the respondents (53.5%) agree that their senior management is committed and have bought-in into the process. 22.8% respondents 'strongly agree' and believe that senior leadership is fully committed to carbon management in their universities. The survey findings indicate satisfactory state of senior management leadership, but the content analysis suggests that CMPs do not provide evidence for active engagement. An Energy Manager at a post-92 university commented on the important role of senior management buy-in:

> *"The senior level buy-in is essential, but most importantly, them feeling like it is their agenda, and not an agenda that has been thrust upon them"* [Energy Manager]

[5] The terms senior management leadership, senior management commitment and senior management buy-in are used interchangeably in this study. However, senior management leadership is used mainly.

14.9% respondents reported 'neither agree nor disagree', who might not be sure of the level of engagement of their senior management. In contrast, 6.1% respondents disagree and are of the view that senior management leadership is not fully committed to carbon management process, which seems to coincide with the CMPs analysis. The Nottingham Trent University's Strategy and Implementation Plan describes the importance of top management support:

> *"In order to achieve the greatest possible success, it is essential to have visible top level support for the Carbon Management Programme. This top level support will in turn open up avenues such that the programme can filter through each level of the organisation and as such enable Nottingham Trent University to achieve and exceed its carbon reduction targets as identified in the Carbon Trust Higher Education Carbon Management Programme and the University's Strategic Plan"* [Nottingham Trent University Strategy and Implementation Plan, p.59]

The Sustainable Engagement Officer at a pre-92 university supports this by quoting that *"no long term thinking from senior management".* A Lecturer in Sustainable Development and Project Management at a post-92 university stated on lack of senior management leadership:

> *"The university has one member of staff who covers both Environmental Management and Health and Safety, so I do not deem the executive to take these issues seriously as clearly more resource would be required"* [Lecturer in Sustainable Development and Project Management]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.6	2.6
	Disagree	7	5.6	6.1	8.8
	Neither agree nor disagree	17	13.5	14.9	23.7
	Agree	61	48.4	53.5	77.2
	Strongly agree	26	20.6	22.8	100.0
	Total	114	90.5	100.0	
Missing	System	12	9.5		
Total		126	100.0		

Table 26: Senior management leadership for carbon management

Due to the importance of leadership, five out of the eighteen universities are trying to ensure the involvement of senior management. Only three universities mentioned in CMPs that their senior management have already bought into the carbon management process, which suggests a lack of senior management leadership in the majority of the universities. The findings of the CMPs contradict the survey findings. The content analysis indicates that universities have awareness and an agreement on the role of senior management leadership, but they have not secured their full engagement yet. However, CMPs do not clearly mention a lack of senior management leadership and do not develop strategies or action plans for their engagement. The CMP of the University of Lincoln states the role of senior management and its impact to embed carbon management:

> *"Carbon Management will be led by senior management and will be embedded across the institution through the alignment of policies, management practices and procedures in support of the low carbon vision"* [University of Lincoln Carbon Management Plan, p. 8]

In contrast, seventeen out of the eighteen universities' CMPs have a 'foreword' from either a member of senior management team or VC with the signature to demonstrate that carbon management is backed up by senior leadership. The sign-off does not provide evidence for the real commitment and engagement of senior management, but universities have started to at least consider it in strategic agenda, if not implement effectively. The University of Leicester's Environment Action Programme (ULeap) supports this.

> *"The Higher Education Carbon Management Programme (HECM) has helped to bring environmental issues to the top of the University's agenda"* [University of Leicester Environment Action Programme (ULeap), P. 7]

Environmental issues may have come to the top of the agenda for consideration, but carbon management is not important for universities. This is supported by an Energy Officer at a post-92 university; who was sent an email [6] to explore lack of senior management commitment and improvement strategy.

> It is hard to say why the senior level commitment does not appear to be there. I think carbon management is not the most important item they have to think about. What am I doing to rectify this? I've tried to show how other universities have bigger environment teams and that the members of their CMP groups are from executive and senior management staff who attend and chair the meetings. I put business cases to senior management with paybacks etc. [Dated: 21/11/2013]

5.6.1. Strategic vision

Strategic vision for carbon management is a sub-theme of senior management leadership and it denotes having a long term vision of achieving a low carbon university. Fourteen out of the eighteen universities have developed a strategic vision as part of their CMPs. However, not all universities have explicitly mentioned 'carbon' in their strategic vision; indeed some universities mentioned wider and less clear terms such as 'environment' and 'sustainability'. The content analysis showed that the majority of the universities are visionary in terms of carbon management and environmental sustainability from a strategic perspective. Eight out of the fourteen universities are aiming to be a HE sector leader, whereas two want to be a 'world leader'. The following extracts demonstrate the examples of strategic visions of universities:

> *"Our vision for the next decade is to become a world-leading university which will produce the next generation of global leaders in business and technology with a sound understanding of the principles of sustainable development and in particular the need for us to reduce our carbon dioxide emissions and those of other greenhouse gases"* [Heriot-Watt University Carbon Management Plan, p.1]

[6] Email and LinkedIn quotes are presented in text boxes in the thesis. After the survey, eleven respondents were contacted directly; eight were contacted via emails and three via direct messages on LinkedIn.

> *"The University of Edinburgh accepts the moral, legal and practical responsibility to take effective action on climate change and welcomes the opportunity to show leadership in doing so. This includes action to reduce the carbon footprint of our direct operations as well as our indirect emissions"* [The University of Edinburgh Climate Action Plan, p.3]

The above quotations indicate that both universities aim to be leader in reducing carbon emissions. Since the development of their CMPs, both universities have not been able to realise their strategic vision. The UL 2015 positions of the University of Edinburgh and Heriot-Watt University are 44th and 59th respectively. This suggests that universities are ambitious and aim to achieve leadership role, but the situation in reality is different. Despite this, the University of Bradford has a vision to be a world leader in carbon management not only in HE sector, but beyond.

> *"The University has adopted targets that once achieved will continue the journey of the University becoming sector leaders, however, our aspiration is to move beyond this and become World Leader"* [University of Bradford Ecoversity - One Planet Strategy, p. 6]

5.6.2. Corporate strategy

Like other business organisations, universities have strategic plan or corporate strategy. An institution's corporate strategy reflects the importance of carbon management in the context of wider organisational strategy and typically sets out an action plan to meet the accompanying strategic visions. Eight universities specifically mentioned carbon management or environmental sustainability as a theme in their corporate strategy indicating that universities have included a corporate commitment to carbon management in their CMPs. The strategic plan of some universities quotes carbon management or environmental sustainability as one of the main corporate objectives. This indicates that carbon management has at least gained attention of senior management at corporate level. Below quotations indicate the level of commitment towards carbon management in strategic plans of two universities.

> *"Carbon management is now viewed by many of Loughborough University's Executive Leadership Team as being of primary importance to the future operation and development of the University. The University has made a commitment within its Corporate Strategic Plan (2006 – 2016)"* [Loughborough University Carbon Management Plan, p. 10]

> *"We make a commitment in our University's Corporate Strategic Plan to manage for environmental sustainability. The work of the Carbon Management Plan supports this overarching objective"* [University of Derby Carbon Management Plan, p.5]

The above extracts indicate that universities have made commitments to implement carbon management in their strategic plans and CMPs support the overarching strategic objectives. Senior management leadership has a key role in integrating carbon management into corporate strategy of the university. Cardiff University's CMP discusses the impact of a change in senior management leadership on carbon management in the university. The CMP states that with the appointment of a new VC, the university addresses all of the stakeholders to manage emissions in its corporate strategy.

> *"The university has a new Vice Chancellor. One of his key objectives in his 'Cardiff University: The Way Forward 2012-2017' document to all staff is for the control of carbon emissions to fulfil our commitment to sustainability"* [Cardiff University Carbon Management Plan, p.3]

In the survey, university managers were asked if their universities have integrated environmental sustainability into corporate strategy and whether carbon management is an integral part of it. 48.7% and 27.8% respondents agree and strongly agree with the statement respectively. This indicates that environmental sustainability (and carbon management) is a strategic theme for the majority of the universities and they have started incorporating it within strategic policy documents. In contrast, 10.4% and 2.6% respondents reported that their universities have not integrated environmental sustainability into corporate strategy yet.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.6	2.6
	Disagree	12	9.5	10.4	13.0
	Neither agree nor disagree	12	9.5	10.4	23.5
	Agree	56	44.4	48.7	72.2
	Strongly agree	32	25.4	27.8	100.0
	Total	115	91.3	100.0	
Missing	System	11	8.7		
Total		126	100.0		

Table 27: Integration of environmental sustainability into corporate strategy

There is an overlap between the findings of the survey and the content analysis. Integration of carbon management into a university's strategic plan may result in its integration into other university strategies. For example, the Sustainability Manager at a post-92 university commented that carbon management is integrated into estates strategy and the same respondent reported that the university has integrated environmental sustainability into corporate strategy.

> *"Carbon Management at X[7] is incorporated into the Estate Strategy and as a result is factored into capital planning"* [Sustainability Manager]

Risks and opportunities

As part of a corporate strategy, this section explores if universities, particularly senior management leadership, are aware of potential risks of carbon emissions and the opportunities associated with implementing carbon management. The majority of the respondents, 57.4% agree and 22.6% strongly agree, reported that their universities are aware of the risks associated with carbon emissions of their business activities. In contrast, 7.8% respondents disagree on universities' understanding of the risks associated with carbon emissions. In addition, 10.4% respondents opted for neither agree nor disagree.

[7] The university is anonymised by putting 'X'

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.9	.9
	Disagree	9	7.1	7.8	8.7
	Neither agree nor disagree	12	9.5	10.4	19.1
	Agree	66	52.4	57.4	76.5
	Strongly agree	26	20.6	22.6	99.1
	Don't know	1	.8	.9	100.0
	Total	115	91.3	100.0	
Missing	System	11	8.7		
Total		126	100.0		

Table 28: Risks associated with carbon emissions

The majority of the respondents (50.9% agree and 22.8% strongly agree) reported that their university is aware of the opportunities associated with carbon management. 8.8% of the respondents disagree with the statement and 16.7% respondents neither agree nor disagree for some reasons. The Head of Environmental Strategy at a post-92 university commented on the understanding of opportunities arising from carbon management. He added that universities cannot do much due to issues such as cost, availability of technology and the timing, despite their intent of implementation. This suggests a gap between strategic intention and implementation.

> *"Yes the university is aware of carbon opportunities and also the costs. However, there are a number of aspects where the opportunity cost is too much, not technologically ready, or the timing for the positive intervention is not right. Perhaps a question along these lines shows not just awareness, but also intent of implementation"* [Head of Environmental Strategy]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	10	7.9	8.8	8.8
	Neither agree nor disagree	19	15.1	16.7	25.4
	Agree	58	46.0	50.9	76.3
	Strongly agree	26	20.6	22.8	99.1
	Don't know	1	.8	.9	100.0
	Total	114	90.5	100.0	
Missing	System	12	9.5		
Total		126	100.0		

Table 29: Opportunities associated with carbon management

5.6.3. Strategic decision-making

Strategic decision-making has a key role and this theme assesses if carbon management is integrated into strategic decision-making process of universities. The survey respondents were asked if carbon management is central to their business activities and strategic decision-making. Table 30 indicates that currently carbon management is not central to the business activities and strategic decision-making process. The majority of the respondents (36.8% disagree and 8.8% strongly disagree) reported that carbon management is not integrated, whereas 30.7% respondents neither agree nor disagree. This suggests that they do not want to answer or they are not aware of it. In contrast, 19.3% respondents agree on this statement and are of the view that their universities have integrated carbon

management into decision-making and business activities. This finding is supported by the qualitative data provided in the comments section. The Head of Sustainability at a pre-92 Russell Group university supported the view of the majority:

> *"I would not say that carbon is a primary concern of most units within the university when they are developing their business plans - they may (should) consider it - but I would not describe this as 'central"* [Head of Sustainability]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	10	7.9	8.8	8.8
	Disagree	42	33.3	36.8	45.6
	Neither agree nor disagree	35	27.8	30.7	76.3
	Agree	22	17.5	19.3	95.6
	Strongly agree	4	3.2	3.5	99.1
	Don't know	1	.8	.9	100.0
	Total	114	90.5	100.0	
Missing	System	12	9.5		
Total		126	100.0		

Table 30: Strategic decision-making process in universities

A Sustainability Manager at a pre-92 Russell Group university supported the majority and argued that the university is committed to carbon management only from cost savings and efficiency point of view, suggesting that universities do not incorporate carbon management while making strategic decisions.

> *"The university is committed to carbon management from a cost saving and efficiency point of view. However, carbon management does not influence the strategic decisions on the types of courses we offer or which countries we recruit from"* [Sustainability Manager]

The Development Director at a pre-92 university argued that the decisions are made with carbon management considerations where possible, but it is not a key priority in decision-making due to other competing business demands.

> *"In a large organisation, there are competing demands and to date carbon reduction although sought where possible, is not a key driver in many procurement and activity decisions"* [Development Director]

An Unknown Respondent[8] argued that carbon management is only integrated into estates and buildings related activities, but it is not central to all of the university's decisions such as recruitment of overseas students as part of the internationalisation strategy.

> *"Carbon management is very well integrated into some of the university's activities and decisions – e.g. new buildings incorporate the highest sustainability standards from the very start of the design process. However, carbon is not central to all of our considerations, e.g. student recruitment from overseas etc."* [Unknown Respondent]

[8] An Unknown Respondent is mentioned as this respondent did not provide information in the demographic section of the survey.

The Head of Environmental Sustainability at a post-92 university was contacted on LinkedIn exploring how carbon management can be embedded into strategic decision-making.

> With a lot of difficulty and by putting your head on the block with the high likelihood that it will be chopped off! Telling a room full of professors how to run a university is career limiting move. Having a carbon reduction target in the strategic plan is for most universities as good as it gets. [Dated: 20/11/2013]

The Head of Environmental Sustainability at a post-92 university argued that it is difficult to persuade academics in senior management team to do so. Universities have not mainstreamed carbon management. The incorporation of carbon reduction targets within strategic plans is as good as they have done so far. The extract also indicates a lack of authority of middle managers implementing carbon management.

Conflicts between carbon management and core business and growth

The first phase of the research identified potential conflicts between carbon management and core business activities and growth. Some of the conflicting issues can be student experience, out of hours opening of buildings & facilities and international student recruitment & travel, business travel and growth of business and university estates. An Assistant Director (Engineering and Maintenance) at a pre-92 Russell Group university highlighted the challenge of potential conflicts.

> *"The desire for institutions to grow, and at the same time reduce carbon emissions, creates a conflict"* [Assistant Director (Engineering and Maintenance)]

The Carbon and Sustainability Manager at a post-92 university raised the issue of conflicts between internationalisation and carbon management.

> *"Aspirations by the universities to increase their international student numbers and be recognised globally as first class education and research establishments conflicts with sustainable transport principles"* [Carbon and Sustainability Manager]

This section aims to investigate whether universities are able to manage the conflicting issues from university managers' perspective. The survey results in Table 36 show a diverse range of responses. The majority of the respondents (37.5%) were ambivalent and neither agree nor disagree on this strategic issue. However, it does not give a clear picture of the current situation of conflicts management in universities. Following that, 27.7% respondents disagree and 2.7% strongly disagree with the statement, indicating that universities are not able to manage the conflicts between carbon management and core business and growth. In contrast, 25.9% respondents agree and 5.4% strongly agree and believe that their universities are able to manage the conflicts. Therefore, it can be concluded that some universities are managing these conflicts, whereas it is difficult for some universities to do so. The Sustainability Manager at a post-92 university stated that the university is struggling due to rapid growth of core business. The below quotation indicates that relative emissions are reduced, but absolute emissions are increased due to growth, as found in the content analysis.

> *"Core business has grown substantially in the last 5 years, and the carbon reductions are struggling to keep-up. Relative emissions have reduced substantially, but absolute emissions have gone up slightly"* [Sustainability Manager]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.7	2.7
	Disagree	31	24.6	27.7	30.4
	Neither agree nor disagree	42	33.3	37.5	67.9
	Agree	29	23.0	25.9	93.8
	Strongly agree	6	4.8	5.4	99.1
	Don't know	1	.8	.9	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 31: Conflicts between carbon management and core business and growth

An Environmental Manager at a post-92 university supported the above argument.

> *"You can't grow your business/continue to add buildings to your estate and reduce carbon emissions simultaneously"* [Environmental Manager]

The above quotations suggest that growth is one of the key issues causing increase in carbon emissions. An Energy Officer at a pre-92 university stated:

> *"On-going expansion makes year on year emission reductions difficult to achieve"* [Energy Officer]

A follow up email was sent to the Carbon and Sustainability Manager at a post-92 university investigating what the university is doing to manage the conflicts between internationalisation and carbon management. The response indicates that middle managers in estates do not have participation in the strategic planning and decision-making. Therefore, they cannot influence at strategic level apart from providing information to the senior management.

> There is currently nothing being done to manage this conflict at the moment, as far as I am aware. I have pointed it out as a conflict with the university, and that is where my remit stops. I do not have a responsibility for the strategic direction of the universities, as my role is within X who is the estates and facilities provider for the two universities only. We do not get involved with matters such as the strategic plan for each institution, curriculum content or their own staff development/training in sustainability issues. [Dated: 21/11/2013]

5.7. Funding and resources

This section explores the sources of funding to implement carbon management strategies because energy and carbon reduction projects in CMPs require financial investment. A number of funding mechanisms are established for projects. Seventeen universities' CMPs include the availability of funding to implement the projects. Each of the seventeen universities uses funding from different sources available. Universities seem to be allocating funding as much as they can to ensure that carbon reduction measures are implemented and targets are met, as set out in CMPs. Loughborough University quotes that significant capital investment is required.

> *"Significant capital investment will be required to both assess the feasibility and implement major infrastructure projects that will deliver significant carbon benefits. A full review of the grants and financial support that are available at both a local and national level should be undertaken periodically to ensure the university maximise the funding opportunities that are available"* [Loughborough University Carbon Management Plan, p.7]

The above quotation indicates that universities explore multiple funding options to maximise opportunities because one source of funding may not be enough to implement the planned projects. Therefore, universities seem to constantly look for more funding due to issues around funding. DMU shows its commitment of investment as:

> *"The university is committed to investing in new technology to achieve reductions in carbon emissions. This investment will encompass energy efficiency, better design and where possible, renewable technologies"* [DMU Carbon Management Plan, p.13]

The survey gained managers' perspective on how committed their universities are to provide the required financial and managerial resources for the implementation of projects. The majority of the respondents (44.1%) agree that their universities provide sufficient financial and managerial resources for carbon management. In contrast, there were significant numbers of respondents (19.8%), who disagree and 7.2% strongly disagree, suggesting a lack of resources. There were 21.6% respondents who neither agree nor disagree on the availability of required resources. An Energy and Environmental Manager at a post-92 university argued that university has made investment in energy reduction and achieved significant results.

> *"The university has made significant investments into reducing energy consumption in the past and achieved admirable results"* [Energy and Environmental Manager]

An Assistant Director Environment at a post-92 university stated that the universities do not have dedicated budget for carbon reduction and funding is awarded on a case by case basis.

> *"The university will fund carbon reduction initiatives on a case by case basis, but there is no budget allocated specifically to this corporate objective"* [Assistant Director Environment]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	8	6.3	7.2	7.2
	Disagree	22	17.5	19.8	27.0
	Neither agree nor disagree	24	19.0	21.6	48.6
	Agree	49	38.9	44.1	92.8
	Strongly agree	8	6.3	7.2	100.0
	Total	111	88.1	100.0	
Missing	System	15	11.9		
Total		126	100.0		

Table 32: Financial and managerial resources

5.7.1. Sources of funding

Universities have various funding sources available to them. The majority of the universities (eleven out of the eighteen) mention the joint HEFCE and Salix Revolving Green Fund (RGF) for the projects. Salix Finance Ltd helps accelerate public sector organisations investment in energy and carbon reduction projects through 'invest to save' mechanism. The principle of the RGF is that the financial savings generated from interest free loans for energy and carbon reduction projects are recycled back to the central fund for re-investment in other projects. The RGF has two strands,

Transformational Fund and Institutional Small Projects Fund. The transformational fund aims to tackle large scale projects (in the range of £1-4 million per institution), which will transform the university's approach to manage energy consumption and reduce emissions (HEFCE, 2008c). Four universities have implemented large projects through the transformational fund. The other seven universities used funding through the institutional small projects fund, which is a ring-fenced budget for smaller projects. Four universities are using the 'Long Term Maintenance Programme' budget mainly for energy conservation works in buildings. Three universities have set their budget from the 'Capital Funding Programme', which is used in addition to other sources. The Assistant Director Environment at a post-92 university stated that funding approval is given by senior management on a case by case basis based on business case.

Two universities have planned to use 'Renovation and Redevelopment' budgets for both redevelopment and carbon reductions. Projects funded from these budgets can serve the dual purpose of energy efficient renovation and redevelopment. Three universities mentioned the possibility of external grants and additional resources in CMPs. There are different organisations and agencies that can further support carbon reduction projects. Two universities have mentioned in CMPs that there is potential for the suitability of the Energy Performance Contracts (EPCs) in their universities under which the EPC provider offers a financial vehicle to implement energy and carbon reduction projects. None of the sample universities has implemented EPC model so far, but the universities can adopt EPC model in future depending upon its viability. Loughborough University states that a number of companies are offering EPCs as a financial model with guaranteed savings. EPCs are aimed to address financial, technical and procurement related issues. Figure 25 presents the funding options available to universities.

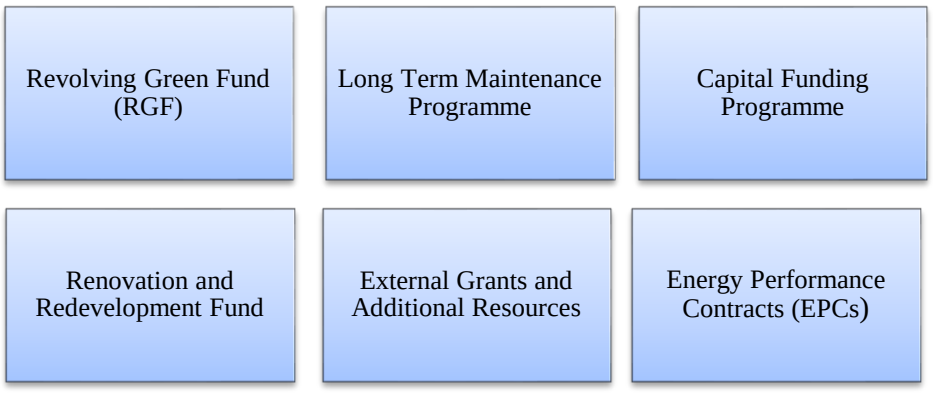

Figure 25: Funding options available to universities

CMPs do not discuss the costing procedures for the proposed projects and only one university mentioned it. It is stated that each small project costs in terms of the capital expenditure (Capex) required, the operating expenditure (Opex) and need a life-cycle perspective. Currently, most of the universities do not seem to have ring-fenced carbon and energy related internal budgets. Four

universities plan to adopt the strategy of fixed budgets and re-invest savings into future initiatives in a cycle.

> *"Establish a carbon management fund pot into which monetary savings from previous carbon management projects can be placed and then used to fund future carbon management projects"* [Nottingham Trent University Strategy and Implementation Plan, p.41]

CMPs do not discuss whether previous investments in carbon reduction projects have met anticipated carbon and cost savings in business cases. The University of Leicester states that there is a tendency to 'cherry pick' projects based on shorter payback period and it is not the right approach. The university states that 'Quick Win Projects' have lesser payback period and are a top priority. The 'Long Term projects' require higher investment and have longer payback period and universities tend to avoid that. This suggests that implementing carbon reduction projects have a low priority as far as financial investment is concerned.

> *"The 'Quick Win projects' are those that have lesser payback period. These projects are of top priority to the university as they are quick energy and cost savers and contribute to the reduction of carbon emissions. The university has financial threshold. The 'Long Term projects' require a higher investment and result in longer payback period"* [University of Leicester Strategy and Implementation Plan, p.29]

5.7.2. Human Resources (HR)

Three universities explicitly mentioned 'resources' and referred mainly to human resources (HR) i.e. staff's time and skillset required for implementing carbon management strategies. However, this theme is not specifically addressed in the majority of universities' CMPs. Two of the universities mentioned the recruitment of a Carbon Reduction Manager and an Energy Manager as deployment of resources. Two of the universities consider staff time and engagement as a key part of HR. The CMPs discuss responsibility for implementing carbon management which suggests that the majority of universities have dedicated personnel for this task. Most of the universities have small teams to implement carbon and wider environmental management. A Lecturer in Sustainable Development and Project Management at a post-92 university identified a lack of resources.

> *"The university has one member of staff who covers both Environmental Management and Health and Safety, so I do not deem the executive to take these issues seriously as clearly more resource would be required"* [Lecturer in Sustainable Development and Project Management]

The University of Lincoln plans to expand environment team by hiring a Carbon Reduction Manager.

> *"The environmental team has been expanded with the creation of the post of Carbon Reduction Manager, providing a dedicated resource to deliver this plan and embed carbon management within all the university operations and activities"* [University of Lincoln Carbon Management Plan, p.5]

As far as the managers' knowledge and skills are concerned, the majority of the respondents reported that managers have knowledge and understanding for measuring carbon emissions and management. This is due to the presence of dedicated staff members in universities' environment teams, who are

experts in energy and carbon management. The Sustainability Officer at a post-92 university commented on the issue of HR and stated that universities' environment teams have different numbers of staff, but he is the only person in his university and may require more resources. The same was reported by the Lecturer in Sustainable Development and Project Management above. Sustainability (and carbon management) needs to be embedded across the organisation as part of job roles rather than making it the responsibility of one particular department.

> Basically, I am a one-man sustainability team - other HEIs have teams of 10 or more. It's tempting to consider recruiting help, but my experience at BT shows that it is better for sustainability to be embedded across organisations as part of people's roles rather than being located in one particular unit, which tends to be seen as peripheral to core activity. [Dated: 18/11/2013]

5.8. Carbon footprinting

The content analysis found that emissions measurement is an important element of the carbon management process. The respondents were asked if their universities have measured carbon emissions from their business activities and what is the boundary of the measurement or carbon footprint. All 126 participants responded to this question with 93.7% noting that their universities have calculated carbon emissions to start managing and reducing them as part of policies and strategies. In contrast, 4% respondents reported that measurement of carbon emissions is in progress and only one university has not measured its carbon emissions. This indicates that universities have started to implement carbon management because *"calculating an emissions baseline is the first step in enabling the university to quantify its carbon footprint and to gain a better understanding of its overall carbon contribution*" [Loughborough University Carbon Management Plan, p. 15].

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	118	93.7	93.7	93.7
	No	1	.8	.8	94.4
	In progress	5	4.0	4.0	98.4
	Don't know	2	1.6	1.6	100.0
	Total	126	100.0	100.0	

Table 33: Carbon emissions measurement in universities

5.8.1. Operational boundaries

As far as the boundary of carbon emissions measurement is concerned, the majority of the universities have only measured scope 1 and 2 carbon emissions. Nine out of the eighteen universities (50%) have measured scope 1 and 2 as reflected in their CMPs. Eight universities have measured scope 1 and 2 with 'selected parts of scope 3 emissions' and only one university has measured complete carbon footprint based on scope 1, scope 2 and scope 3 emissions. The selected parts of scope 3 emissions chosen by the eight universities are related to waste and water. Out of these, three universities have also calculated emissions associated with staff and student commuting and business travel. Two universities have measured emissions associated with procurement and supply chain. This indicates

that the majority of the universities have not measured their scope 3 carbon emissions and hence, they have not set scope 3 targets for its management. The emissions related to procurement and supply chain, international student travel, business travel and staff and student commuting are overlooked. CMPs incorporate scope 1 and 2 emissions for measurement and targeting over which they have more control. However, many of the universities are planning to measure and target scope 3 in future.

> *"Initially scope 1 and scope 2 emissions will be included within the carbon management plan, however moving forward scope 3 emissions will need to be measured and incorporated within the plan"* [Loughborough University Carbon Management Plan, p. 18]

The survey results found that the majority of the respondents (39.5%) reported that universities have calculated scope 1, 2 and selected scope 3 emissions. The selected scope 3 emissions are those emissions where data are available such as water and waste, as found in the content analysis. 26.9% of the respondents reported that the universities have measured only scope 1 and 2 missions. Similarly, 26.9% respondents mentioned that the boundary of emissions measurement is scope 1, 2 and 3. This is in contradiction with the findings of the content analysis. In regards to scope 3 elements, universities do not have complete and accurate data for calculations, as explored in the content analysis of CMPs.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Scope 1, 2	32	25.4	26.9	26.9
	Scope 1, 2, 3	32	25.4	26.9	53.8
	Scope 1, 2 and selected scope 3 emissions	*47*	37.3	39.5	93.3
	Don't know	8	6.3	6.7	100.0
	Total	119	94.4	100.0	
Missing	System	7	5.6		
Total		126	100.0		

Table 34: Sources of carbon emissions in universities

Selected scope 3 carbon emissions sources

The survey investigated the selected parts of scope 3 carbon emissions through an open-ended question. As stated above, there were 39.5% respondents who mentioned the boundary of emissions measurement as 'scope 1, 2 and selected scope 3 emissions' and therefore, the majority of the universities have adopted this boundary. 35 respondents gave a range of comments and outlined sources of emissions. The following numbers of respondents mentioned the measurement of emissions from selected scope 3 sources such as procurement, business travel, waste, water, staff and students commuting and travel.

Procurement	**Business travel**	**Waste**	**Water**	**Staff commuting**	**Students commuting**	**Travel**
12	13	14	12	14	11	5

Table 35: Selected scope 3 carbon emissions sources

Table 35 shows that universities have started to measure scope 3 emissions. The Carbon Reduction Manager at a pre-92 Russell Group university complemented that *"we are currently in the process of measuring scope 3".* An Energy Manager at a pre-92 university stated that *"selected scope 3 emissions are waste, water, commuting and business travel. We are starting measuring this year, i.e. 2013/14".* However, there are many universities that have not done so. Selected scope 3 emissions are varied and different universities are working on different categories of scope 3 emissions.

Scope 1 and 2 carbon management

Direct emissions related to energy consumption in buildings (including Information and Communication Technologies (ICT)) and transport fleet i.e. scope 1 and 2 were discussed in almost all of the CMPs. Direct fuel and energy usage such as gas for heating, purchased electricity and transport fuel used in universities' own fleet vehicles are the examples of scope 1 and 2. ICT can make a significant contribution towards scope 1 and 2 due to its energy intensity and can also impact scope 3 carbon management through low carbon procurement of ICT equipment. However, universities have not clearly discussed strategies to manage ICT related emissions. Only four universities' CMPs highlight the issue of transport fleet related emissions and how universities are planning to address these emissions. This theme is not particularly discussed in majority of the CMPs and this may be due to lesser carbon impact of their transport fleet. Electricity and gas consumption has, however, received much attention in CMPs, may be due to direct cost implications for universities. For example, the University of Cambridge has higher electricity consumption (79%) as compared to the average of the HE sector (62%) for 2005/06 baseline, as a consequence of the energy consumption associated with scientific and technical research compared with universities with higher proportions of teaching in arts and humanities related subjects. This indicates that majority of the universities are focused on measurement and management of scope 1 and 2.

Scope 3 carbon management

HEFCE proposed that universities should commit to scope 3 carbon management with the intention of measuring emissions and setting targets. The majority of the universities (fifteen out of the eighteen) are planning to include these in their CMPs. Some of the universities have already made estimates of scope 3 emissions, but have not developed the reduction targets with accurate carbon footprint and some are about to set the targets. The majority of the universities aim to have significant impact on reducing scope 3 emissions, but there are challenges such as reliability of data and standard methodology for calculations. Therefore, universities are first focusing on improving data management.

> *"The absence of a suitable methodology and the difficulty of obtaining meaningful data for huge range of materials procured by the university means that it has not been possible to consider this factor at the present time. The assumptions are used to arrive at the preliminary estimates of the university's scope 3 emissions. Further work is on-going to refine these estimates using more reliable data"* [University of Cambridge Carbon Management Plan, p.17]

Universities are struggling for scope 3 data and then be able to calculate complete scope 3 emissions. An Assistant Director Environment at a post-1992 university elaborated that:

> *"The university has very strong data collection and monitoring for scope 1 and 2, but has little in place for scope 3 .There is a mechanism for business travel and some academic travel, but nothing else"* [Assistant Director Environment]

Consequently, universities have started to work on scope 3 carbon management with the first step to calculate baseline.

> *"Work is being undertaken to gain a greater understanding of the university's scope 3 emissions. At this stage, quantification of a baseline for scope 3 emissions will be the first target. Subsequently, meaningful reduction targets will be established for scope 3 against the baseline*" [University of Birmingham Carbon Management Implementation Plan, p.8]

Universities agree on the importance of scope 3, but for a research intensive university, the smaller scale of scope 3 relative to scope 1 and 2 is a barrier. However, this is not the case with many other universities where scope 3 emissions are more than scope 1 and 2. For example, DMU.

> *"The university recognises that scope 3 emissions are important and will continue to seek to introduce schemes to reduce them. However, it must be recognised that they are substantially smaller than emissions associated with building usage, which must remain the main focus of attention in order to make significant reductions in the university's overall carbon footprint"* [University of Cambridge Carbon Management Plan, p.18]

Procurement

Procurement is an important part of scope 3 emissions and the majority of the universities (fifteen out of the eighteen) mentioned this in their CMPs and are planning to develop strategies to reduce these emissions. Despite the fact that universities do not have scope 3 targets, four of the universities have set measures to reduce emissions from their procurement and supply chain activities; however the majority of the universities have not done so. According to the survey results, the majority of the respondents (31.3% disagree and 11.3% strongly disagree) reported that carbon management is not integrated into procurement process, which complements the findings of the content analysis. In contrast, significant number of respondents (25.2%) agrees and 3.5% strongly agree and seem to believe that carbon management is effectively integrated. 28.7% respondents were ambivalent on this issue and ticked neither agree nor disagree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	13	10.3	11.3	11.3
	Disagree	36	28.6	31.3	42.6
	Neither agree nor disagree	33	26.2	28.7	71.3
	Agree	29	23.0	25.2	96.5
	Strongly agree	4	3.2	3.5	100.0
	Total	115	91.3	100.0	
Missing	System	11	8.7		
Total		126	100.0		

Table 36: Carbon management into procurement process

Procurement and supply chain emissions are at very early stage of development in universities. Two of the sample universities participated in the Department for Environment. Food and Rural Affairs (DEFRA) funded Sustainable Procurement Programme run by the EAUC in 2008. This project brought together a number of universities and sector bodies for low carbon procurement, but there seems to be ambiguity about the success of this programme. The University of Lincoln states that carbon management is not integrated into the procurement process and only a basic criterion is set for suppliers. This is not meaningful for the process and seems to be a 'tick in the box'.

> *"At present, carbon reduction principles are not systematically included as part of the standard procurement process. However, a common set of supply chain principles that require all suppliers tendering for work to meet minimum environmental criteria is in place"* [University of Lincoln Carbon Management Plan, p.27]

One university discussed use of the government's Flexible Framework for Sustainable Procurement, 'Procuring the Future' strategy 2007. The Development Director at a pre-92 university commented on the state of carbon management into procurement activities.

> *"With regard to procurement process, carbon management is embedded in estates procurement of major projects, but less so on smaller projects and hardly at all in research equipment"* [Development Director]

This suggests that carbon management is mainly incorporated into the procurement activities of estates operations for major projects, but faculties do not consider it for purchasing research equipment. The Head of Environmental Sustainability at a post-92 university disagreed with this argument and he was asked through LinkedIn what is being done to embed carbon management into procurement. He argued that faculties and departments control their procurement spending and there is a lack of central control. However, universities can raise awareness among staff to influence decision-making, but strategies for scope 3 in general and procurement in particular are in developing stage. The extract of the LinkedIn message is in the text box below.

> A large proportion of the procurement spend is with the faculties and departments and cannot be controlled through any centralised procurement processes. Awareness raising is the only action at the moment. [Dated: 20/11/2013]

An Energy Officer at a pre-92 university complemented this argument:

> *"Strategies for scope 3 are in early stages as baseline year has only just been established"* [Energy Officer]

The Director of Estates and Facilities at a post-92 university commented that the university has limited strategies in scope 3. An email was sent to investigate the reason and how it can be improved. He agreed with the argument presented by the University of Cambridge's CMP in relation to data.

> It is the gathering of data from people, postcodes, travel itinerary overseas and travel to work. I have started the process of gathering the information for Estates & Facilities Directorate purely on intersite mileage at this stage. The academics and rest of the university are going to be a challenge because everything is committed via a paper system. [Dated: 20/11/2013]

An Assistant Director of Environment at a pre-92 university noted that there is a lack of resources for data collection and management of scope 3, hence the focus on scope 1 and 2. This is in line with the findings of the CMPs.

> *"The university is strong in the management of scope 1 and 2, but weak in scope 3 areas. There are mechanisms in place to develop management systems and data collection, but progress is slow because of resources"* [Assistant Director Environment]

Travel

Staff and student commuting, business travel, visitors' travel and international/home student travel is included in the calculation of travel related emissions. Thirteen out of the eighteen universities factored in the management of emissions relating to travel in their CMPs and ten universities developed a separate 'Travel Plan' for reducing travel related emissions by encouraging staff and student to move towards the use of more sustainable travel options. Some of the universities are also conducting travel surveys to establish most widely used current modes of travel to and from their campuses to use as a baseline for improvement. 39.5% respondents mentioned the boundary of emissions measurement as scope 1, 2 and selected scope 3 emissions and only five universities reported the calculation of travel related emissions and therefore have yet to set targets. However, the fact some strategies do exist, indicates that universities simply lack a systematic approach to implementation. Travel and transport related emissions are the key areas of focus in CMPs followed by energy related emissions in buildings. The above argument is supported by the University of Birmingham's Carbon Management Implementation Plan.

> *"The University's Travel Plan covers a five-year period from 2010 to 2015 and aims to achieve a change in culture at the university to more sustainable travel during this period. The Travel Plan is a living document and as such will continuously develop as necessary to address the changing needs of the university and the environment in which it operates"* [University of Birmingham Carbon Management Implementation Plan, p.23]

Staff and students mode of travel and transport to and from campus was specifically mentioned in ten CMPs. Staff and student commuting has received more attention than other areas of scope 3 emissions. As far as international student and business travel is concerned, these areas have been overlooked in the CMPs. Only one university mentioned all of these travel categories indicating the fact that there is room for universities to explore the carbon impact of different types of travel and develop strategies.

> *"Work to-date on travel and transport has been limited to the provision of a student and staff bus travel scheme aimed at reducing car mileage in and around Aberystwyth"* [The University of Wales, Aberystwyth Carbon Management Plan, p. 11]

Waste and water

Carbon emissions are produced during the treatment and supply of water and from the transportation, treatment and disposal of waste. Eleven universities, out of the eighteen, mentioned waste management and four mentioned water use reduction in their CMPs, because emissions related to

waste and water have an indirect impact on a university's carbon footprint. Due to small contribution of water related emissions, there is not much emphasis in CMPs.

> *"However, within the scope of the carbon management plan, there is unlikely to be a strong emphasis on reducing water use as even substantial volume savings will make a relatively small contribution to reducing the university's overall carbon footprint"* [University of Lincoln Carbon Management Plan, p.21]

Waste and water are the two streams of scope 3 on which the majority of the universities are relatively more focused. Universities are using staff and student awareness campaigns to promote waste reduction and recycling. The Queen's University of Belfast states that it is necessary to minimise waste and maximise recycling based on the waste hierarchy, Reduce, Re-use, Recycle, and Disposal.

5.9. Carbon reduction targets

Each of the eighteen universities has set carbon reduction targets in their CMPs. Some universities have very ambitious targets, whereas others are relatively less ambitious. CMPs state the universities' carbon reduction targets along the baseline year. These targets indicate organisational commitment towards carbon management in response to the HE and the national targets. The individual targets of universities contribute towards the overall HE targets, as the HEFCE targets are the main driver for universities. The HEFCE sets carbon reduction targets for 2020 and 2050, but universities have only set targets for 2020. This may be because 2050 is simply too far away to make a calculated predicted target. Campuses will change drastically in 30 + years. In addition, some universities have established interim or short term targets to track the progress of the main target. According to the CMP, DMU has set the same target as that of the HE sector for scope 1 and 2, which is 43% carbon reduction by 2020 based on 2005/06 baseline (HEFCE, 2010b). DMU is the only university that has developed the target with two interim targets (12% by 2012 and 29% by 2017). The CMP of the Nottingham Trent University states that the targets are minimum figures, but the university aims to exceed.

> *"Objective and target figures are to be regarded as bare minimums and as such it will be anticipated that these figures will be exceeded"* [The Nottingham Trent University Carbon Management Plan, p. 12]

Robinson et al. (2015) suggest that interim carbon reduction targets should be included as one of the HEFCE requirements allowing universities to identify future challenges in meeting the reduction target through early action. People and Planet (2014b) suggests that short-term targets are critical to reducing the impact of cumulative emissions and tracking progress against long-term targets. The content analysis found that presently, universities have only set targets for scope 1 and 2 emissions and do not have them for scope 3. The University of Lincoln's CMP and the University of Bradford's Ecoversity - One Planet Strategy have targets of 43% and 50% (scope 1 and 2) by the year 2020 respectively, indicating universities' commitment towards carbon management. The survey respondents were asked whether or not their universities have developed carbon reduction targets. The majority of the respondents (95.9%) reported that their universities have developed targets; whereas 2.5% indicated that their universities are still developing targets. This result is in line with the content

analysis. Therefore, the findings indicate that universities having measured carbon emissions have set reduction targets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	117	92.9	95.9	95.9
	No	1	.8	.8	96.7
	Developing targets	3	2.4	2.5	99.2
	Don't know	1	.8	.8	100.0
	Total	122	96.8	100.0	
Missing	System	4	3.2		
Total		126	100.0		

Table 37: Carbon reduction targets in universities

An Environmental Manager at a post-92 university highlighted that there is a lack of understanding among university managers with regards to setting carbon reduction targets. He criticised the baselines of 2005/06 and 2008/09 in target setting as per the HEFCE guidance and argued that universities should use the 1990 baseline which aligns with the UK's Climate Change Act 2008. In contrast, the majority of the universities have 2005/06 baseline, as found in the content analysis.

> *"There is a complete lack of understanding regarding the targets we are working to. As far as I am aware, we should all be working to the criteria set out in the 2008 CCA. The problem is that very few universities have accurate 1990 emissions figures and those produced for scope 1&2 emissions by SQW for HEFCE are subject to conjecture. Taking a 2005/6 or 2008/9 baseline will not in my opinion satisfy the 2008 CCA criteria, so I fail to see the merits of having 'Carbon Management Plans' using these baselines"* [Environmental Manager]

5.9.1. Scope of carbon reduction targets

The respondents that have developed or developing targets were asked about the scope of their targets i.e. are they examining scope 1, 2 and 3 emissions and setting targets accordingly. The majority (N=27) commented that their universities currently have targets for scope 1 and 2. Seven respondents mentioned that they are in the process of developing targets for scope 3 and only two respondents stated that their universities have targets for scope 1, 2 and 3. As investigated earlier, 39.5% and 26.9% of the respondents stated that universities have measured emissions from 'scope 1, 2 and selected scope 3 emissions' and 'scope 1, 2, 3' respectively, but targets are only set for scope 1 and scope 2 emissions. In addition, respondents from the same university seem to have different level of understanding of targets. For example, two respondents from the same institution gave different information with one person commenting that they have targets for scope 1 emissions and the other respondent indicated that the university has targets for both scope 1 and 2. This indicates a lack of understanding and poor communication between managers at the institution on same issues. Despite having scope 1 and 2 targets, universities are working towards scope 3 targets, but it is challenging.

> *"Targets are set for scope 1 and 2 and we are in the process of establishing baselines and then targets for scope 3"* [Energy Reduction Manager]

5.9.2. Types of targets

There are two types of targets which universities can adopt, absolute and relative. *"An absolute target is usually expressed in terms of a reduction over time in a specified quantity of greenhouse gas (GHG) emissions to the atmosphere, the unit typically being tonnes of CO_2e. An intensity target is usually expressed as a reduction in the ratio of GHG emissions relative to another business metric"* (WRI and WBCSD, 2004, p.77). For relative targets, the most common indicators are per meter square floor area (Per m^2 area), per Full Time Equivalent (FTE) student and per unit turnover and emissions are expressed as carbon dioxide equivalent (CO_2e). The issue of absolute and relative (intensity-based) targets emerged while analysing the CMPs, however, the distinction between the two types is not clear in the CMPs. Universities might mean absolute targets in the plans unless it is mentioned relative against a certain indicator.

The content analysis found that the majority of the universities (eleven out of the eighteen) have absolute targets as mentioned in their CMPs. Two universities have set both absolute and relative targets, possibly for different reporting purposes, i.e., internal and external reporting. Similarly, the survey found that the majority of the respondents (86.4%) reported that their universities have set absolute targets. Five respondents did not know the type of targets. For example, the Director of Sustainable Development at a post-92 university was not aware of the type of targets. This was quite surprising to the researcher and may suggest lack of communication and co-ordination. He quoted *"Sorry can't remember. Please check the policy".* The University of Derby has 27% absolute target by 2020 from a 2005 baseline.

> *"The targets to be reported to HEFCE are absolute carbon reductions and as such do not reflect the dynamic nature of the business and estate. We have therefore applied our own normalised targets against FTE staff and students and in the case of vehicle fleet emissions against mileage"* [University of Derby Carbon Management Plan, p.3]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Absolute targets	102	81.0	86.4	86.4
	Relative targets (Per FTE student)	2	1.6	1.7	88.1
	Relative targets (Per m^2 area)	3	2.4	2.5	90.7
	Don't know	5	4.0	4.2	94.9
	Any other business matrix	6	4.8	5.1	100.0
	Total	118	93.7	100.0	
Missing	System	8	6.3		
Total		126	100.0		

Table 38: Types of carbon reduction targets

Three universities have mentioned relative targets in CMPs; these are research based universities having high energy consumption. The survey found that a minority of universities have relative targets with two having targets against per FTE student and three against per m^2 area. The University of

Birmingham states that relative emissions are reduced despite it conducts energy intensive research. This indicates that relative targets allow business growth.

> *"As a research led university, a significant proportion of the energy consumed is for energy intensive applications. Despite this, there has been a significant reduction in carbon emissions when compared to growth (financially and in terms of staff/student numbers)"* [University of Birmingham Carbon Management Implementation Plan, p. 5]

The Principal Teaching Fellow at a pre-92 Russell Group University argued that absolute targets are not appropriate particularly for research intensive universities. This is due to the impact of energy intensive and laboratory spaces on emissions which is 10X greater than other spaces. For example, a medical school could have more energy intensive facilities for research that may result more emissions of larger research based universities (Klein-Banai and Theis, 2013). This indicates that absolute targets might not be suitable particularly for research based universities.

> *"I do not feel that absolute targets are appropriate to HEIs and that has been part of the problem with some unrealistic target setting - e.g. research intensive Warwick setting 60% absolute target is naive at best"* [Principal Teaching Fellow]

Robinson et al (2015) support the above argument and state that targets based on key performance indicators (KPIs), a business metric such as revenue, number of employees or floor area, ensure fairness and enable performance to be compared across institutions. An Assistant Director Environment at a post-92 university supported relative targets against the floor area and identified the role of absolute targets for the planet.

> *"Carbon against floor area makes the most sense for reducing density of carbon emitted and benchmarking, and absolute measures work best for the planet"* [Assistant Director Environment]

Impact of growth

Given the continued business growth, the targets relative to a business metric recognise growth of university. The University of Cambridge describes that for the research intensive universities, the most appropriate business metric for relative targets is their income. This is because emissions are dominated by energy and carbon intensive research and result in huge cost.

> *"It is important therefore that the setting of targets for future emissions should take account of any further potential growth in activity, and that concerted efforts be made to ensure that emissions due to research activity itself are minimised"* [University of Cambridge Carbon Management Plan, p. 8]

The University of Cambridge suggests that it is necessary for research-intensive universities to explore a mechanism that could allow separate treatment of carbon emissions associated with research activities from the emissions associated with other university activities, for example building envelope, catering facilities and administrative process. The University of Northampton's CMP states that despite the increase in absolute emissions, per capita carbon emissions are reduced which are measured in tCO_2 per FTE student. This indicates that an increase in absolute emissions may result in reduction in relative emissions due to increasing student population. The Carbon and Sustainability Manager at a post-92 university mentioned that the university is using 'relative targets (per meter

square floor area)' and the respondent was contacted to investigate why the university is not using absolute targets:

> We are unable to apply absolute reduction targets from the 2005 baseline as the campus has grown by around 90% since that date. This is something that was recognised by HEFCE at the time of preparing our first carbon management plan and is the reason for why a reduction per m^2 of GIA was agreed instead. The m^2 reduction target was developed in conjunction with advice from the Carbon Trust, although this was well before I started working with X. The rate of campus growth is likely to slow over the next couple of years, and it is our intention to produce a further carbon reduction plan and targets using a different baseline year (probably 2013/14) upon which we can set realistic absolute carbon reduction targets for up to 2050. [Dated: 21/11/2013]

The above extract indicates that absolute reductions are in contradiction with any type of growth. An Assistant Director (Engineering and Maintenance) at a pre-1992 Russell Group University was asked how universities can manage the balance between growth and carbon management.

> The relationship between growing the institution and reducing carbon emissions is a tricky one. We have developed some metrics which seek to express carbon emissions on a 'per unit' basis; for example, emissions per student, emissions per £ of turnover, emissions per m^2. This allows us to track emissions on 'a level playing field'. However, we cannot escape the absolute figure of tonnes of carbon emitted by the institution which will be pushed up as the university grows. New investment should of course take carbon emissions into account. [Dated: 21/11/2013]

Another option of 'any other business matrix' was provided for the survey respondents so that other matrices are explored. Six respondents ticked this option and three respondents mentioned that the universities use absolute and relative targets for both internal and external reporting. The Head of Sustainability at a pre-92 Russell Group university stated that "*We have absolute targets, but we also monitor and measure against all of the above relative metrics".* The Health, Safety and Environmental Advisor (HS&E) at a post-92 university provided a critique on absolute targets and suggested a rolling baseline.

> *"I think HESA needs to pull their finger out on start providing a rolling baseline reporting procedure in line with GHG Protocol rather than absolute against a static baseline"* [Health, Safety and Environmental Advisor]

Carbon emissions baseline

Carbon emissions baseline indicates a fixed base year against which carbon management performance is benchmarked. Universities have used the methodology and conversion factors taken from the DEFRA/DECC's guidance to calculate carbon emissions. The measurement of emissions is the first step to get an understanding of a university's carbon footprint and targets are set as part of carbon management process. Carbon emissions are usually calculated based on an academic year (1st August - 31st July). The majority of the universities (eleven out of the eighteen) have set the baseline of 2005-06 academic year for their calculations and targets, which aligns with the guidelines of the HEFCE. As many universities in the sector do not have complete or accurate data for 1990, so HEFCE decided to use 2005-06 as an alternative baseline. Few universities have used different years as their baseline, as shown in Table 39.

> *"The institution's carbon emissions baseline has been calculated using data from 2005/6 academic year (1st August 2005 to 31st July 2006). This year has been chosen as it is the earliest year for which reliable and complete data is readily accessible, and is the year that HEFCE is using for the HE sector emissions baseline. The university's financial year also runs concurrently with the academic year from 1st August to 31st July so resource implications and financial savings will be reported concurrently"* [The University of Northampton Carbon Management Plan, p.11]

Table 39 presents the statistics of baseline year and the number of universities that have used this.

Baseline year	1990-91	2004-05	2005-06	2007-08	2009-10
No. of universities	1	2	11	3	1

Table 39: Carbon emissions baseline year of universities

5.10. Governance

Governance refers to all the processes by which policies and strategic decisions are made (Renz, 2007). The governance of an institution typically involves the strategic management and decision-making at a senior level. In this study, governance refers to the processes by which decisions and strategies are implemented from operational management perspective. It aims to manage a diverse range of elements in the carbon management process and this theme addresses all those elements derived from the analysis of CMPs. However, eleven universities specifically mentioned the term 'governance' and it involves a range of sub-themes. These universities have discussed issues around governance for the successful implementation of CMPs and meeting the targets. At an operational level, governance for implementing carbon management starts with the monitoring of energy and fuel consumption and then calculate carbon footprint. University managers were asked if universities have robust procedures to monitor energy and fuel consumption. 51.3% respondents agreed and 33% strongly agreed with the statement. Similarly, the content analysis considered monitoring as an important part of the process and found that a range of monitoring systems are available for universities in the market. However, the data which is monitored is mainly related to scope 1 and 2 emissions, as explored in Section 5.6.1. To support that, the majority of the respondents (52.2% agree and 27% strongly agree) reported that that there are effective procedures and managers have knowledge and information for calculating an accurate carbon footprint. Data seems to be the key for governance, as an Energy Reduction Manager at a pre-1992 Russell Group university mentioned:

> *"We are currently reviewing and improving data integrity which will improve all of the above"* [Energy Reduction Manager]

Loughborough University's CMP states the role of governance in the carbon management programme:

> *"In order to ensure that there is effective and on-going ownership of the carbon management programme, it is important to define a governance or accountability structure for the programme"* [Loughborough University Carbon Management Plan, p.40]

The University of Northampton states that governance of the CMP rests with senior managers in the executive board. The main idea is to lead carbon management from the top and achieve a top-down approach, which could develop organisation-wide ownership. In the University of Northampton,

governance and strategic ownership resides with the 'Carbon Management Programme Board' with senior members such as the Pro Vice Chancellor (Strategic Planning and Resources), Director of Estates, Director of Finance and Dean of the School of Science and Technology. This indicates senior level involvement in governance.

> *"Governance of the programme as well as the strategic ownership of the university's carbon reduction target, rest with the Programme Board, composed of the University's Pro Vice Chancellor (Strategic Planning & Resources), Director of Estates, Director of Finance and Dean of the School of Science and Technology"* [The University of Northampton Carbon Management Plan, p.6]

5.10.1. Communication

Communication is a key performance indicator in the 'Carbon Management Matrix', which is used to evaluate carbon management performance in universities. Fifteen out of the eighteen universities mentioned communication as a governance issue for implementing carbon management strategies. The content analysis indicates that communication is related to various aspects of carbon management ranging from communicating energy and emissions data, carbon management targets and strategies and novel energy and carbon reduction initiatives to the relevant stakeholders. Most of the universities aim for effective communication practices in their CMPs. There are two types of communication, internal and external. Universities are mainly focused on internal communication for engagement with stakeholders, mainly staff and students. The University of Lincoln quotes on the role of communication:

> *"Regular and relevant communications to support a transition to a low carbon culture across the university will continue"* [University of Lincoln Carbon Management Plan, p.8]

An effective communication strategy can help raise awareness and change behaviour of different stakeholders across the organisation, which may contribute in meeting carbon reduction targets.

> *"A key element of ensuring that the carbon reduction target is achieved is through delivering a successful communications strategy to help implement behavioural change across all aspects of the university's activities"* [University of Birmingham Carbon Management Implementation Plan, p.31]

In the survey, university managers were asked if carbon management targets, strategies and performance are communicated to all of the stakeholders. Table 40 below reports that the majority of the respondents (56.3% agree) think that university communicates $_{\text{targets}}$, strategies and performance and 13.4% respondents strongly agree. Conversely, there are 13.4% of the respondents who disagree on the effective communication to stakeholders and seem to believe that targets, strategies and the performance are not communicated effectively. 15.2% respondents neither agree nor disagree. The respondents have varying opinions on communication issue. A Lecturer at a post-92 university highlighted a lack of communication.

> *"There may well be some of the above carbon management issues; however staff is not privy to this information"* [Lecturer in Sustainable Development and Project Management]

The majority of the respondents provided positive feedback about the carbon management practices of their institutions, but there is a room for further improvements. CMPs lack clear communication

strategies and plans within universities. An Environmental and Cultural Change Manager at a pre-92 university stated:

> *"Need better communication to ensure good practice shared across organisation - devolved management, budgets, etc. make things difficult"* [Environmental and Cultural Change Manager]

The comment made by a Student at a pre-92 university indicates a lack of communication and participation in the university:

> *"As I am not party to the vast majority of the internal decision-making processes of the university, I cannot comment on their communication of such issues to all parties"* [Student]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.9	.9
	Disagree	15	11.9	13.4	14.3
	Neither agree nor disagree	17	13.5	15.2	29.5
	Agree	63	50.0	56.3	85.7
	Strongly agree	15	11.9	13.4	99.1
	Don't know	1	.8	.9	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 40: Communication to stakeholders

Means of communication

Communication is discussed as part of the development of CMP. Three of the universities have separate 'communication strategies' for implementing carbon management or broader environmental sustainability. A communication strategy is mainly developed to ensure that all key stakeholder groups are participating and co-ordinating in delivering the CMP. As far as means of communication are concerned, each of the fifteen universities uses different channels to communicate their carbon management message. The most commonly used methods for communication are websites, magazines/newsletters, university reports, awareness raising/behaviour change campaigns, workshops, environmental champions' network, information screens/digital displays and staff trainings and inductions. However, the use of social media has not received much attention in the CMPs. Four universities are carrying out employee inductions to inform new employees about the environmental goals of universities. The Strategy and Implementation Plan of the Nottingham Trent University has integrated energy and environmental management good practices in induction.

> *"All new staff to have energy and environmental good practice inductions along with traditional fire and health and safety inductions etc. in order to instil energy and environmental awareness"* [Nottingham Trent University Strategy and Implementation Plan, p.41]

This is an effective method of communicating the message and could help instil awareness of carbon management. However, the majority of the universities do not have a similar plan in place instead opting for traditional induction events. While websites are mainly used to publicise CMPs both

internally and externally, the extent to which stakeholders are engaged with the websites is unclear. Only one university mentioned joint working relationship with the marketing and communications team to promote carbon management. Communication departments can play a key role in carbon management process within universities, but this opportunity is ignored.

5.10.2. Ownership

This sub-theme discusses the sense of ownership among internal university stakeholders at all levels, whether individuals or departments. Ownership could directly link with responsibility for carbon management and it can be official or unofficial responsibility. However, some of the universities have used ownership in similar terms as responsibility. Seven universities' CMPs particularly mention ownership for carbon management. Most of the universities aim to build university wide ownership for carbon management, but strategies for ownership are not well defined in the plans. Universities appear to make claims around ownership and engagement. The University of Derby states that the vision of carbon management can be achieved by embedding it into the culture and the university is planning to create sense of ownership. However, embedding carbon management into the culture is challenging and the universities do not provide comprehensive plans to develop ownership.

> *"The vision of carbon reduction at the university is long lasting and by embedding this into the culture of the university and creating a sense of ownership by all, we hope it will endure well into the future"* [The University of Derby Carbon Management Plan, p. 5]

Nottingham Trent University discussed the role of ownership and linked the success of carbon management with ownership.

> *"The carbon management programme has the greatest chance of continued success, it is essential to identify full ownership of the programme from the outset. Identifying ownership at the beginning of the programme will ensure that there is the greatest chance of the programme successfully passing through the governance structure of the university and as such maximising the potential success of the programme whilst meeting the commitments identified within the University's Strategic Plan, of reducing the carbon footprint of the university"* [Nottingham Trent University Strategy and Implementation Plan, p.59]

In the CMP, the University of Derby identified the role of HR and stated that the Director of HR aims to ensure that sustainability is included in all of the university policies and the HR department aims to communicate the message across the organisation. This is not the case in most of the CMPs.

Cross-faculty and departmental ownership

The ownership can be either at an individual or departmental level. This section discusses ownership at a faculty and departmental level. The survey tested whether there is cross-faculty and departmental ownership for carbon management in universities and it can exist within and between different functions and roles. The majority of the respondents (36.6%) disagreed and reported that there is no cross-faculty and departmental motivation and ownership within their universities. In addition, 4.5% of the respondents strongly disagreed. This reflects a lack of ownership in most of the universities. The Head of Sustainability at a pre-92 Russell Group university agreed with the majority of the respondents and stated that carbon management is not central to the departments.

> *"I would not say that carbon is a primary concern of most units within the university when they are developing their business plans - they may (should) consider it - but I would not describe this as 'central'"* [Head of Sustainability]

An Environmental and Sustainability Officer at a post-92 university quoted on a lack of understanding and ownership among faculties and directorates.

> *"We have some good behaviour change programs in place working with the National Union of Students (NUS). Currently faculties and directorates within the university are not aware of how they contribute to the overall carbon footprint"* [Environmental and Sustainability Officer]

Lack of ownership could be due to faculties and departments having different focus and priorities.

The Development Director at another pre-1992 Russell Group University supported this argument and highlighted that the departments do not have much benefits in reducing emissions.

> *"Different departments have differing levels of interest and commitment to carbon reduction and carbon is not their first thought with regard to space utilisation! The university has separate campuses and there is little benefit to stakeholders adjacent to our campuses for facilities related carbon reduction measures"* [Development Director]

In contrast, 23.2% respondents agree and 3.6% strongly agree indicating that cross-faculty and departmental motivation and ownership exists in their universities. 31.3% respondents did not give their opinion on this issue and opted for neither agree nor disagree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	4.0	4.5	4.5
	Disagree	41	32.5	36.6	41.1
	Neither agree nor disagree	35	27.8	31.3	72.3
	Agree	26	20.6	23.2	95.5
	Strongly agree	4	3.2	3.6	99.1
	Don't know	1	.8	.9	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 41: Cross-faculty and departmental ownership

Universities have mentioned terms such as whole organisational, integrated and strategic approach in CMPs. The majority of the universities, thirteen out of the eighteen, aim to achieve whole organisation approach. This may indicate an involvement of departments and stakeholders to manage emissions from all of the university operations. However, these terms appear to be buzzwords. University of Lincoln states that carbon management is not a stand-alone concern and is recognised as a whole-organisation approach in its CMP.

> *"Rather than a stand-alone concern, carbon management is recognised by the university as a whole-organisation approach, which integrates with existing strategic aims and management systems. This approach enables a clear view of the carbon impact of all university operations and activities and allows key risks and opportunities to be identified and built into a plan to reduce carbon emissions effectively"* [University of Lincoln Carbon Management Plan, p.6]

5.10.3. Organisational structure

Organisational management structure has a key role in governance. Loughborough University's CMP describes that organisational structure is key to develop governance or accountability structure to develop effective and on-going ownership for carbon management. Accountability within the management structure would make someone answerable for the performance of carbon management process and it can be at both strategic and operational level. Most of the CMPs do not discuss accountability as part of management structure in their CMPs. The CMP of Loughborough University states that management structure needs to be defined with accountability.

> *"In order to ensure that there is effective and on-going ownership of the carbon management programme, it is important to define a governance or accountability structure (management structure). Accountability should be established at strategic and operational level"* [Loughborough University Carbon Management Plan, p. 40]

Five universities' CMPs discuss the role of management structure for embedding carbon management at an organisational level. The management structure aims to ensure that carbon management does not stand alone in a particular department or only with few individuals. The University of East Anglia discussed the role of integrated management structure in its CMP.

> *"The key to a successful carbon reduction plan is an active and integrated management team that are willing to promote carbon reduction in their day to day activities as well as ensure that the plan remains on course to achieve the targets"* [University of East Anglia Carbon Reduction Plan, p.37]

The content analysis found that there are differences in organisational and management structure of the universities. The survey investigated the organisational structure in relation to carbon management by asking managers if the current organisational structure in their universities is effective for implementing carbon management strategies. The majority of the respondents, 42.9% agree and 5.4% strongly agree, reported that the organisational structure is effective for implementation. In contrast, the monitory of the respondents, 16.1% disagree and 2.7% strongly disagree, think that the structure is not effective and 33% respondents are not clear, as they ticked neither agree nor disagree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.4	2.7	2.7
	Disagree	18	14.3	16.1	18.8
	Neither agree nor disagree	37	29.4	33.0	51.8
	Agree	48	38.1	42.9	94.6
	Strongly agree	6	4.8	5.4	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 42: Organisational structure for carbon management

The structure of an organisation has an influence on carbon management and change in the structure can impact particularly at senior management level. The Sustainability Manager at a post-92 university commented:

> *"Recent management and organisational changes have blurred the understanding and effectiveness of carbon management within the senior management"* [Sustainability Manager]

To support that, an Environmental Manager at a post-1992 university argued that the retirement of key individuals from the university had a significant impact on the management.

> *"The university has undergone significant realignment following the retirement of a number of key personnel. Realignment of the business has taken precedent over stewardship of sustainability. We are now endeavouring to catch up"* [Environmental Manager]

One university discussed the decentralised nature of management structure. The CMP describes that most of the large departments employ their own technical and maintenance staff. However, the main administrative functions such as finance, estates and human resources are under the central administration department and estates management is the largest function of it. Therefore, decentralised management can impact effective implementation of the CMP.

5.10.4. Environmental benchmarking

Universities are seeking to reduce environmental impact from all areas of operations and there are various environmental benchmarking schemes available in the UK HE sector to report and compare performance against the sector competitors. The majority of the universities (thirteen out of the eighteen) have adopted various environmental benchmarking schemes to embed environmental and carbon management into their operations. These tools impact carbon management performance, both directly and indirectly. However, all of the benchmarking schemes mentioned in the CMPs are optional. The most common environmental and sustainability related schemes and tools having an impact on carbon emissions are People & Planet's University League (former Green League), EcoCampus, International Standardization Organisation's (ISO) 14001, Green Gown Awards, BREEAM and the Carbon Trust Standard. University League is the annual league table of UK universities ranked by their environmental performance. EcoCampus is the leading Environmental Management System (EMS) designed for the higher and further education sector. Universities are planning to participate in these schemes and many of the universities are already part of it. Leeds Beckett University, former Leeds Metropolitan University, stated its achievements in implementing these schemes:

> *"It became the first English Higher Education Institution (HEI) to achieve the international environmental standard (ISO 14001) in 2003. LMU implemented the first carbon management plan in 2006, came first in People and Planet's inaugural Green League Table in 2007, and achieved the Carbon Trust Standard in 2009"* [Leeds Beckett University Carbon Management Strategy, p. 2]

Ten out of the thirteen universities have adopted BREEAM aiming to achieve 'Excellent' for new build and 'Very Good' for refurbishment projects. There is one university that aspires to achieve BREEAM 'Outstanding' in its CMP, which is quite ambitious. One university mentioned the HE sector specific 'BREEAM Higher Education'. The University of Leicester strives to achieve BREEAM 'Excellent' and ISO 14001.

> *"To strive to achieve an 'excellent' rating under the BREEAM scheme on all new buildings and major refurbishment projects and to work towards certification with an energy efficiency or an environmental management system based upon ISO 14001 standards"* [University of Leicester Carbon Management Implementation Plan, p. 12]

Three CMPs discuss achieving the Carbon Trust Standard, University League and EcoCampus, which recognise carbon management practices in their methodology. Two of the universities are planning to implement the ISO 140001 EMS. In the CMPs, there was only one university that mentioned the Green Gown Awards, which has a separate category on carbon reduction. There are many universities participating in this award and the University League, but they have not mentioned it in their CMPs. This suggests a disjointed approach to carbon management and CMPs lack a comprehensive planning approach. Furthermore, two universities mention their participation in the 'Universities that Count', which does not exist anymore. These benchmarking tools could provide universities an infrastructure to embed carbon management and broader sustainability in their organisations, but CMPs are not focused on planning for these tools. These schemes have the potential to showcase good practice and provide evidence to senior management and build reputation. Heriot-Watt University states that:

> *"An explicit outcome from the work undertaken for the Carbon Management Programme is the ability to achieve the Carbon Trust Standard to recognise the reality of good carbon management and actual quantifiable reductions* [Heriot-Watt University Carbon Management Plan, p. 3]

5.10.5. Space management

Space management emerged as a distinct sub-theme in the content analysis. The aim of space management is to use space efficiently and effectively to support business activities, thereby reducing the financial costs and carbon emissions. Loughborough University complements this argument in its CMP and states that space management reduces carbon emissions and helps to save resources.

> *"Good space management not only reduces carbon emissions, it also freezes up resources that can be used for teaching and research"* [Loughborough University Carbon Management Plan, p.32]

Eight out of the eighteen universities' have mentioned space management in their CMPs. They have planned to adopt strategies to use space in efficient manners for their business activities. However, this is the area, where many universities are not focused and space management is not embedded into carbon management strategies and plans. This has not emerged as a prominent theme and is overlooked. One of the universities has implemented a central timetabling system and a Space Allocation sub-committee to review existing space usage and post-occupancy use. Furthermore, there is only one university that has space management policy and it is mentioned in its CMP. The University of Birmingham believes that significant carbon savings are expected from improvements in space management by developing 'Sustainable Excellence Programme'.

> *"One aspect of the Sustainable Excellence programme is to further increase the efficiency of space use and focus on a smaller, smarter and more sustainable estate. This will allow capital investment and maintenance to be targeted to improve the quality of existing estate and ensure new developments achieve excellent standards. Significant CO_2e savings are expected from improvements in space utilisation"* [University of Birmingham Carbon Management Implementation Plan, p.20]

This suggests that space management can result in savings of emissions and leads to financial and resource savings. Similarly, HEFCE (2011) reported that the environmental performance of HE has improved due to more efficient use of space. But, space management is overlooked by majority of the universities. Moreover, the survey investigated whether universities are utilising space of their estate effectively with carbon management considerations. 31.3% respondents agree and 4.5% respondents strongly agree that their universities are utilising space effectively. The Director of Estates at a pre-92 university college and a Sustainability Manager at a post-92 university commented that their universities have plans to reduce the size of estate and improve carbon management.

> *"College has new strategy to reduce size of estate and make more efficient use of remaining facilities"* [Director of Estates]

> *"Much management focus is on a future campus consolidation, which should improve carbon performance in the next 5 years"* [Sustainability Manager]

In contrast, 28.6% respondents disagree and 5.4% strongly disagree on this issue, which suggests that universities do not manage their space with a motive of carbon management. 30.4% respondents neither agree nor disagree, indicating that they do not have an opinion. The Head of Sustainability at a post-92 university highlighted the issue of resistance from senior academics for effective space usage.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	6	4.8	5.4	5.4
	Disagree	32	25.4	28.6	33.9
	Neither agree nor disagree	34	27.0	30.4	64.3
	Agree	35	27.8	31.3	95.5
	Strongly agree	5	4.0	4.5	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 43: Space management in universities

5.11. Stakeholder engagement

Stakeholder engagement emerged as one of the key themes in CMPs. Half of the CMPs (nine) mentioned the role of stakeholder engagement in the effective delivery of CMPs. Universities seem to be focusing on stakeholder engagement that allows coordination for maximum impact of strategies, but there is a lot more work that needs to be done. CMPs do not explicitly identify stakeholders relevant to carbon management process and also do not present strategies to engage them. The University of Lincoln defined 'stakeholders' in relation to carbon management as below:

> *"Stakeholders are those parties either within or external to the university who will be affected by the programme to reduce carbon emissions and may influence its success"* [University of Lincoln Carbon Management Plan, p.28]

The universities discussing stakeholder engagement have an agreement that carbon management needs engagement and response at all organisational levels. The University of Nottingham emphasises the organisation wide engagement, but it seems that it is not there yet in many of the universities.

> *"The Plan requires engagement at all levels of the university – from individual behavioural changes to institution led initiatives – in order that the objectives are understood and that contributions are made to maximise delivery of the targets. We want to foster a 'can do' approach and response across the university"* [The University of Nottingham Carbon Management Plan, p.2]

5.11.1. Staff and student engagement

Among the university stakeholders, staff and student is the largest stakeholder group and has received more focus in the CMPs. Universities are attempting to engage staff and students with appropriate engagement strategies. Due to this, the majority of the universities (ten out of the eighteen) have clearly elaborated staff and student awareness and engagement activities in their CMPs.

> *"The university has an objective to increase energy awareness in staff and students"* [University of Leicester Strategy and Implementation Plan, p. 11]

Loughborough University's CMP states that every member of university staff and student needs to get engaged for successful carbon management and achieving the targets set out in the CMP.

> *"If the university is serious about meeting the challenge of achieving the targets set out within this plan and be seen as a leading low carbon campus within the Higher Education sector, every member of staff and the student body needs to engage in the carbon agenda"* [Loughborough University Carbon Management Plan, p. 3]

Queen's University Belfast argues that successful implementation of the CMP requires engagement of staff and students rather than only focusing on technical approaches to carbon management.

> *"The successful implementation of the CMP, which builds on the mobilisation of the whole organisation, rather than focusing on a strictly technical approach to carbon saving, requires the commitment of all staff and students"* [Queen's University Belfast Carbon Management Plan, p.4]

All of the above quotations indicate the key role of staff and student engagement. Universities are implementing a range of projects around change management, awareness raising and behavioural change as part of staff and student engagement strategies. One of the university's CMP explains that increasing staff and student awareness and training programmes have proved to be effective for carbon management across the university. However, staff training and education programmes do not seem to be fully developed in the majority of universities. In regard to knowledge and understanding of carbon management, the majority of staff and students might not understand major parts of CMP due to its complexity and technical terminologies used. CMPs seem too technical and difficult to understand for ordinary staff and students who do not have experience or education in this subject area. This is one of the major barriers to cultural change. The following quotation reflects the Queen's University Belfast's plans of dealing with human factors.

> *"A comprehensive awareness raising and educational programme will continue to be developed to help staff and students understand carbon management and its impact on the university"* [Queen's University Belfast Carbon Management Plan, p.5]

The content analysis suggests that CMPs are focused on staff (mainly junior and middle level) and students and do not discuss engagement of senior managers, who are part of senior management or executive team and are involved in strategic decision-making and management. Some of the CMPs provide a 'forward' or statement from a senior executive or VC, but that does not mean they are fully engaged in the process. CMPs do not clearly discuss how universities plan to engage senior management. Moreover, one university is planning to engage cleaning, security and HR department for carbon management. This indicates the role of every department in the carbon management process. Another university recognises the increasing role of student unions in its CMP. Student unions could play their part in engaging students effectively, but there is a lack of active participation.

Behaviour change and awareness programmes

The survey participants were asked about the behaviour change and awareness raising strategies for stakeholder engagement. These stakeholders mainly include staff and students. Behaviour change and awareness raising programmes were found to be an integral part of carbon management process, as reflected in the CMPs. The survey found that more than half of the respondents (52.7%) reported that their universities have behaviour change and awareness raising programmes. There were also 18.8% of the respondents who strongly agree to the statement. This is encouraging to note that the majority of universities are now attempting to engage staff and students. This is in line with the findings of the content analysis. In contrast, 10.7% respondents reported that their universities do not have behaviour change and awareness raising strategies, which may lead to a lack of staff and student engagement.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.9	.9
	Disagree	12	9.5	10.7	11.6
	Neither agree nor disagree	19	15.1	17.0	28.6
	Agree	59	46.8	52.7	81.3
	Strongly agree	21	16.7	18.8	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 44: Behaviour change and awareness raising programmes

However, the focus of stakeholder engagement is more on staff and students and senior management engagement is overlooked. As far as staff is concerned, mainly lower and middle tier staff are the focus of engagement activities who may not have much influence to bring change in the university. An unknown respondent quoted that senior management teams are not engaged in the process and are resistant to provide necessary resources. This suggests that senior management engagement can aid availability of resources for the implementation.

> *"On behaviour change, the resistance is not from staff and students generally, but mainly from senior management who are unprepared to sign off the necessary resources for a coordinated behaviour change projects"* [Unknown Respondent]

5.11.2. Strategic partnerships

Partnership approach is discussed in the CMPs that could help connect various stakeholder organisations for a common cause to move towards a low carbon economy. Partnership can be with any organisation at local, national or international level having same strategic goals of carbon emissions reductions. The content analysis found that six out of the eighteen universities are planning for strategic partnerships in their CMPs. For example, the University of Northampton aims to develop partnership with other organisations:

> *"Partnerships will be further cultivated with external organisations such as West Northamptonshire Development Corporation (WNDC), North Northamptonshire Development Company (NNDC), Northamptonshire County Council (NCC), Northampton Borough Council (NBC), Northamptonshire Enterprises Ltd (NEL), Carbon Trust (CT), Building Research Establishment (BRE), Higher Education Funding Council for England (HEFCE) and Salix Finance to secure innovative carbon reduction opportunities and funding"* [The University of Northampton Carbon Management Plan, p.9]

Aberystwyth University's CMP states its collaboration with the University of Wales, Bangor:

> *"The university is collaborating with the University of Wales, Bangor in a pilot scheme aimed at increasing energy and waste awareness issues amongst staff and students. The scheme is being supported by both the Carbon Trust and the Higher Education Funding Council for Wales".* [Aberystwyth University Implementation Plan, p.11]

A question was asked in the survey to explore if universities are developing strategic partnerships for carbon management. The majority of the respondents (42.9% agree and 8% strongly agree) are of the view that their universities are developing partnerships, which is opposite to the findings of the content analysis. Most of these partnerships are at a local level with small businesses, NHS, local authorities, funding agencies or any other organisations at national and international scale to secure opportunities for carbon management. This suggests that universities seek out opportunities to enhance collaboration with other partner organisations. The Director of Estates and Facilities at a post-92 university mentioned:

> *"Strategic partnership includes partner schools and academies owned by the university"* [Director of Estates and Facilities]

In contrast, there were 16.1% respondents who reported that their universities are not involved in any of the strategic partnerships, whereas 26.8% of the respondents opted for the option of neither agree nor disagree. This indicates that the survey respondents are not aware or sure of carbon management related partnerships and shows a lack of co-ordination.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.6	1.8	1.8
	Disagree	18	14.3	16.1	17.9
	Neither agree nor disagree	30	23.8	26.8	44.6
	Agree	48	38.1	42.9	87.5
	Strongly agree	9	7.1	8.0	95.5
	Don't know	5	4.0	4.5	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 45: Strategic partnerships for carbon management

Two of the universities mentioned in their CMPs that they are represented in city and region wide environmental groups and therefore, it is recognised that universities have an opportunity to extend their impact at a wider city and societal level through strategic partnerships.

Carbon offsetting

Carbon offsetting did not emerge as a common strategy in universities due to their focus on carbon reduction in CMPs. The majority of the universities have not considered it and only four universities discus carbon offsetting. Two of the universities argue that offsetting does not reduce emissions and help mitigate climate change, whereas the other two have developed carbon offsetting projects such as tree planting and renewable energy projects in partnership with the service providers. HEFCE (2010) argues that carbon offsetting is not a cure for mitigating climate change and the most effective way to address the issue of climate change is to reduce actual carbon emissions. Spirovski et al. (2012) are of the view that offsetting is the last mitigation strategy. However, effective carbon offsetting can balance the carbon emissions impact and raise awareness. The majority of the universities want to reduce actual emissions, instead of first producing emissions and offsetting them. HEFCE (2010) states that offsetting might not be used to meet targets, but it can form part of a CMP.

> *"Carbon offsetting may not be used to meet an institution's carbon reduction target for scopes 1 and 2. However, carbon offsetting may form part of an institution's carbon management plan for mitigating the effects of essential activities that create emissions under scope 3. Before choosing to offset, it is important that steps are taken to measure and, where possible, avoid and reduce emissions"* [HEFCE, 2010, p.23]

Sometimes, it can be difficult for universities to reduce emissions due to the nature of their activities. This particularly applies to research intensive universities; for example, the University of Cambridge that has more research income than teaching income. These research based universities could implement offsetting projects to balance their emissions. Due to its research related emissions, the University of Cambridge plans to develop carbon offsetting schemes:

> *"Given the large wall-plug and research related emissions of the university, it is anticipated that growing emphasis will be placed on developing more carbon offset schemes. The university already has a range of local renewable energy generation schemes, but there exists the opportunity to extend these considerably"* [University of Cambridge Carbon Management Plan, p. 28]

Loughborough University argues that universities can use carbon offsets as a last option, which aligns with Spirovski et al. (2012).

> *"Carbon offsetting should only be considered as a last resort to achieving the carbon reduction targets. Only a specified level of emissions will be allowed to be offset. Carbon offsetting will only be implemented via recognised and authorised companies"* [Loughborough University Carbon Management, p. 33]

5.12. Evaluation and reporting

Evaluation and reporting of carbon management performance emerged as a main theme during the content analysis. Monitoring the on-going progress of carbon management and reporting is part of the process. This could explore how carbon management programme is progressing over a period of time. Almost all of the universities' (seventeen) CMPs discuss evaluation and reporting in relation to their carbon reduction targets and planned projects. Universities intend to evaluate and report through different channels. There is a vast array of regulatory and voluntary reporting mechanisms available to universities, as discussed Section 2.2.6. The University of East Anglia's Carbon Reduction Plan states the role of review and evaluation process:

> *"To ensure continued reduction in emissions is maintained, it is essential that the programme, projects and the carbon reduction plan are regularly reviewed"* [University of East Anglia Carbon Reduction Plan, p.33]

The University of Nottingham plans to develop an annual report to monitor and report the progress and provide an update on the targets.

> *"An annual report will be produced to monitor and report on our progress and performance achievements against this plan and to provide an update on the CO_2 reduction projects that will ensure that the remaining targets and objectives are met"* [The University of Nottingham Carbon Management Plan, p.2]

The majority of the universities (thirteen out of the eighteen) have adopted similar internal reporting procedures. Middle managers report progress to senior management group or committee. The senior management group is chaired by a senior manager, who is a member of the senior management team. The senior manager can be a Pro/Deputy Vice Chancellor to ensure high level championing. Then, it will be reported to the university's senior management team and governing council. Cardiff University describes its internal reporting mechanism as:

> *"The Carbon Management Plan Task and Finish Group are currently developing the CMP, which will then report through the Environmental Management Systems (EMS) Steering Group, which is chaired by the Deputy Vice-Chancellor, which will oversee implementation and further development of the plan"* [Cardiff University Carbon Management Plan, p.3]

The above quotation highlights reporting, which the majority of the universities carry out. At an operational estates level, four CMPs mention that universities have adopted a series of Key Performance Indicators (KPIs) to monitor and report the performance. The KPIs include CO_2e emissions, CO_2e emissions per £million turnover or Full Time Equivalent (FTE) staff member and students.

> *"Carbon reduction is incorporated as a KPI at both institutional and School/Directorate level, with progress in meeting targets included in all School and Directorate Annual Performance Reviews submitted to the University Operating Board in November each year. These are, in turn, reported to the University Management Board, the Planning and Finance Committee and, ultimately, to Senate in December"* [Queen's University Belfast Carbon Management Plan, p.6]

Different universities have different timescales for reporting. Half of the universities report the progress annually, both internally and externally. However, the focus is on internal reporting within the CMPs to be able to gain senior management support. The universities report externally through mandatory and optional policies and schemes in the UK, as discussed in Chapter 2. HEFCE also demands that universities measure and report progress against sector-level targets. The University of Northampton defines its objectives in regards to implementation, review and update of the CMP:

> *"The university recognises carbon management as a strategic, whole-organisation approach that integrates with our existing strategy and management, enabling the institution to understand the impact of carbon emissions, to identify key risks and opportunities, to formulate a plan to reduce carbon emissions, to effectively implement, review and update the plan into the future, and to communicate success"* [The University of Northampton Carbon Management Plan, p.7]

According to the CMPs, only one university follows the 'Carbon Trust Periodical Reporting Template' for reporting. The university considers it a well-defined reporting and evaluation system in all of the areas. Three universities particularly mention that they report carbon management progress internally and externally through website and corporate reports. Loughborough University is planning an interesting approach of 'carbon profit and loss account' for measuring the progress and reporting and none of the universities has adopted this.

> **"***As part of the reporting for the carbon management plan, a carbon profit and loss account should be established that starts with the baseline year. This will provide a clear indication on the progress of the implementation plan"* [Loughborough University Carbon Management Plan, p.39]

Review and evaluation

The survey investigated if universities review and evaluate the carbon management process regularly and revise its strategic decisions as appropriate. 50% of the respondents agree and 9.8% strongly agree with this statement. The update of CMPs is part of the review and evaluation process.

> *"I am currently re-writing the CMP because I feel the existing one is ineffective"* [Energy Manager]

An Environmental Manager at a post-92 university reported that the university is updating strategies:

> *"All of these strategies are out of date and require reviewing to reflect our new strategic direction"* [Environmental Manager]

However, review and evaluation appears to be on ad hoc basis as the CMP of DMU states that *"ad hoc assessment of all aspects of carbon/energy policies/strategies, targets and action plans".* In addition, the majority of the respondents (62.5%) reported that their universities are effectively tracking the progress of the targets. 20.5% respondents neither agree nor disagree and 15.2% of the

respondents disagree on the review and evaluation of carbon management. This may suggest that their universities are lacking in review and evaluation approaches.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.9	.9
	Disagree	17	13.5	15.2	16.1
	Neither agree nor disagree	23	18.3	20.5	36.6
	Agree	56	44.4	50.0	86.6
	Strongly agree	11	8.7	9.8	96.4
	Don't know	4	3.2	3.6	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 46: Carbon management review and evaluation

Reporting

Four of the respondents mentioned measuring and reporting procedures in the open-ended question asking for further comments and suggestions. They highlighted reporting related issues being faced by universities. Three of the respondents argued that there seems to be inconsistency and complexity in existing reporting systems for carbon management in the HE sector. External reporting does not seem to be consistent, because there is no standardised reporting infrastructure for universities. An Assistant Director Environment at a post-92 university stated that there are different methods to measure and report emissions and there is no consistency and clarity.

> *"The key issue is all the different ways of measuring carbon emissions - CRC, DECs/EPCs, Estates Management Statistics (HEFCE), relative, absolute, they are all different. The whole sector should follow the legal definition (CRC) for clarity and consistent benchmarking. The correct and consistent measurement of carbon can significantly alter strategies"* [Assistant Director Environment]

The existing reporting mechanisms, as discussed in Chapter 2, are quite bureaucratic and take a lot of time and resources.

> *"Approaches in the sector and beyond have been very bureaucratic (CRC, HESA EMR, University League). More effort goes into filling in returns than actually being able to do something about the problems. Given all the other problems in HE, it is not currently a high priority for College management"* [Acting Director of Estates]

The Higher Education Statistics Agency (HESA) is the official agency having expertise in the collection, analysis and dissemination of the UK HE sector data. It is a comprehensive reporting system and demands mainly reporting of financial, staff/student counts and estates/environmental returns. Environmental reporting includes energy consumption, water usage, carbon emissions and waste. However, HESA reporting can be labour intensive, as indicated by the Acting Director of Estates. Furthermore, an Assistant Director Environment argued on the consistent approach to reporting:

> *"If HEFCE provided 'model' approaches with some flexibility in built to recognise the differences, this would reduce the burden on the smaller universities and get consistency of approach"* [Assistant Director Environment]

Performance of carbon management

This section discusses the overall performance of carbon management from managers' perspective. The majority of the participants (52.7% agree and 14.3% strongly agree) believe that their universities are effectively managing carbon emissions suggesting that middle managers are satisfied with the performance. Contrary, 14.3% of the respondents reported that their universities are not effectively managing carbon emissions. 17.9% respondents opted for neither agree nor disagree and it may suggest that there is something which the respondents do not want to disclose or they are not confident to report overall performance. In general, based on the experience of university managers and statistical results, the performance of universities seems to be satisfactory. The Carbon and Energy Manager at a pre-92 Russell Group university agreed to this:

> *"Universities are generally paying more attention to carbon management and sustainability management and are conscious of the role they can play in creating a sustainable society through their own impact and educating future generations"* [Carbon and Energy Manager]

However, the survey also identified various issues associated with carbon management. Due to this, there seems to be a long way to go for carbon management to be fully established in universities. An Energy Manager stated that *"I think we are on the right path, but still a lot of work to do" and a*n Environmental and Sustainability Manager at a post-92 university also supported this argument by commenting *"we are making progress, but still have some way to go".*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.9	.9
	Disagree	16	12.7	14.3	15.2
	Neither agree nor disagree	20	15.9	17.9	33.0
	Agree	59	46.8	52.7	85.7
	Strongly agree	16	12.7	14.3	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 47: Overall effectiveness of carbon management

Lessons learned

This section investigates if universities learn lessons from the review of carbon management process and incorporate them in the next stage of the strategy. The majority of the respondents (40.2% agree and 11.6% strongly agree) are of the view that universities learn lessons from the reviews of carbon management process and incorporate in the strategy. In contrast, there were 10.7% of the respondents who think that their universities are not incorporating the learning from the previous reviews and experiences into the future strategies. 30.4% respondents were ambivalent and preferred to tick neither agree nor disagree.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.8	.9	.9
	Disagree	12	9.5	10.7	11.6
	Neither agree nor disagree	34	27.0	30.4	42.0
	Agree	45	35.7	40.2	82.1
	Strongly agree	13	10.3	11.6	93.8
	Don't know	7	5.6	6.3	100.0
	Total	112	88.9	100.0	
Missing	System	14	11.1		
Total		126	100.0		

Table 48: Lessons learnt from carbon management reviews

5.13. Responsibility

Responsibility for implementing carbon management emerged as a main theme in the analysis of the CMPs. The majority of the universities (seventeen out of the eighteen) discuss responsibility in their plans. The content analysis found that responsibility varies in universities and different individuals with different job roles are responsible for it. However, it can be divided into three main categories, middle managers, working/task/steering groups and everyone within a university. The majority of the universities' CMPs (ten) indicate that the overall responsibility lies with a working/steering/task group in universities and four of the CMPs state that 'everyone' is responsible for carbon management. The universities assign operational responsibility to implement carbon management plan and strategies to middle managers based in estates or facilities management department. However, the middle managers argue that 'everyone' within a university should be responsible for it, although it is in their job description. Four CMPs state that everyone in the university, all staff and students, are responsible for carbon management. The CMP of De Montfort University (DMU) states:

> *"Carbon emissions at DMU need to be seen as the responsibility of the whole university rather than specific and individual departments"* [De Montfort University Carbon Management Plan, p.13]

The working or steering group generally consists of members from different university departments and faculties such as estates, academics, professional services, senior management and others and is mostly chaired by a senior manager or a member of senior management team. These groups are developed to introduce organisation wide responsibility for carbon management. For example:

> *"The development and delivery of the Climate Action Plan is supervised by the Sustainability and Environment Advisory Group (Operations)"* [The University of Edinburgh Climate Action Plan, p.8]

The structure and line of responsibility varies in universities. Universities operate in their own way and it could impact the carbon management process. The Queen's University Belfast states the line of responsibility in its CMP describing the role of project sponsor, project manager and senior

management level responsibility. The university has developed a Carbon Management Working Group to provide support.

> *"The project sponsor and person responsible at senior management level for the implementation of the CMP is the Registrar and Chief Operating Officer. The Director of Estates is project manager, with operational responsibility for delivering the CO_2 reduction targets. This will be done in conjunction with the relevant Directors, Deans and Heads of School, all of whom have responsibilities for any future projects allocated to them and for achieving the targets which lie within their remit. Support will be provided by the Carbon Management Working Groups"* [Queen's University Belfast Carbon Management Plan, p.42]

The content analysis suggests that there is a lack of clarity on the divide between operational and strategic responsibility.

5.13.1. Operational Responsibility

This section summarises the operational responsibility for implementing carbon management plans and strategies. Five CMPs mentioned operational responsibility for implementing carbon management. The content analysis found that middle managers are responsible for the implementation in universities. Three of the CMPs state that middle managers have operational responsibility, whereas two CMPs state that the operational responsibility lies collectively with a carbon management team or group consisting of middle managers in estates. The middle managers mainly include the sustainability manager, environmental manager, energy manager or carbon manager. This is a full time position in majority of the universities and is based in estates or facilities management department. The CMPs reflect that middle managers seem to be more concerned and relevant to carbon emissions and its management by developing targets. CMPs are developed by middle managers and approved by senior management team. Leeds Beckett University quotes on the operational responsibility:

> *"The Sustainability Manager will be responsible for developing and implementing the carbon management strategy and producing interim reports"* [Leeds Beckett University Carbon Management Strategy, p.6]

In the survey, the respondents mentioned a range of job titles for operational day to day responsibility suggesting that the responsibility for implementation varies and different individuals with different job titles hold responsibility. It indicates diversity in the HE sector. According to the survey results, these roles can be divided into three categories, similar to the content analysis. These are middle managers, senior managers and estate/facilities departments or environmental working groups. The middle managers are based in the estates department and can have different titles in different universities, but main responsibility remains the same. Both Manager and Officer are used for this role, but officer is a junior role than a manger in some universities depending on organisational and estates structure.

113 individuals responded to this question and 13 did not. The majority of respondents (63) stated that middle managers have the responsibility for carbon management, which complements the findings of

the content analysis. 22 respondents reported that Director/Head of Estates or Director/Head of Sustainability has responsibility for carbon management. 24 respondents stated that estates and facilities related department or environmental working group has the responsibility for it. Interestingly, there were two respondents who argued that 'no one' has the responsibility for carbon management and one of the respondents was Facilities Manager at a post-92 university. This indicates a lack of responsibility in the university. There was one university where the respondent stated that Pro Vice-Chancellor for Estates and Infrastructure has the responsibility, which is not the case in many other universities. One of the respondents argued that the University Secretary is responsible for it and none of other respondents mentioned this. Some universities have shared responsibilities and are divided between individuals or departments. There were three universities (two post-92 and one pre-92 Russell Group) from where the respondents mentioned that individual faculties/departments and colleges are jointly responsible with estates team. An Energy Officer at a post-92 university stated that Energy Officer, Environmental Manager, Transport Manager and Procurement Manager have the operational day-to-day responsibility.

> *"Shared between Estates and Buildings Team and individual Colleges"* [Assistant Director (Estates Operations)]

A Health, Safety and Environmental Advisor at a post-1992 university commented that carbon management is the responsibility of few people, but officially, he is responsible for it.

> *"To be fair it sits with a few people, but I believe informally, it is my responsibility to keep it all moving along. I wrote the plan and do the calculations yearly"* [Health, Safety and Environmental Advisor]

All of this evidence suggests that responsibility is somewhat not clear in universities and there is huge diversity in the sector. There is also a lack of consistency over responsibility in universities. Different respondents reported different people responsible for carbon management in the case study university (DMU) suggesting a lack of clarity among stakeholders. As far as authority and involvement in decision-making is concerned, middle managers seem to be lacking in this. An Environmental Manager at a pre-92 university stated that he only has responsibility and does not have any authority. This suggests that middle managers have to work on it due to their role and job description.

> *"It's in my job description. All the responsibility, but no authority"* [Environmental Manager]

Figure 26: Responsibility for carbon management

A word cloud is produced to show a wide range of job titles and departments responsible for carbon management reported by the respondents. In Figure 26, the word cloud illustrates key job titles in universities. Energy Manager, Carbon Manager, Environmental Manager and Carbon Manager are the main individuals in majority of the universities to implement strategies. These are presented in bold letters.

5.13.2. Strategic Responsibility

Strategic responsibility means strategic oversight of the process by a senior manager, probably a member of the senior management team. Seven carbon management strategies and plans explicitly discuss strategic responsibility and it varies from university to university depending upon the organisational structure of the university. Four CMPs mention that Director of Estates has strategic responsibility for carbon management and two of the plans state that it rests with a working or task group of various internal stakeholders. However, only one CMP, the University of Cambridge, states that the Pro Vice-Chancellor (PVC) has strategic responsibility for overseeing carbon management in the university. This is the only university where PVC is championing carbon management. This is not the case in majority of the universities. The senior management level responsibility could help bring carbon management at strategic level and provide support for resources.

> *"The Pro-Vice-Chancellor for Institutional Affairs has specific responsibility for carbon reduction and sustainability"* [University of Cambridge Carbon Management Plan, p.24]

In general, members of senior management team are not fully involved in the carbon management process despite official responsibility, apart from being part of the environmental or carbon management group. Strategic responsibility has not received much attention in the CMPs and there is no evidence of wider responsibility at a VC/PVC level. Therefore, this suggests a gap between operational (middle) and strategic (senior) managers in the universities.

> *"Strategic carbon management is the responsibility of the Director of Estates and Commercial Facilities. Day-to-day operational carbon management responsibility lies with the Carbon Reduction Manager (a full-time post created in September 2010)"* [University of Lincoln Carbon Management Plan, p.23]

5.14. Discussion

This chapter presents the analysis of the eighteen universities' CMPs and survey of the UK universities to explore the current state of carbon management and assess university levels of policy adoption and compliance. Almost all of the universities have CMPs and started to understand the strategic role of carbon management. This is supported by HEFCE (2014b), which states that HE has demonstrated a commitment to carbon management and each university has developed a CMP. However, it does not mean what is planned is practiced because there has been no comprehensive analysis to assess the performance of policies and strategies. There is similarity in the way CMPs are structured. CMPs are a valuable tool that has put universities on the pathway of carbon management. This finding corresponds with Robinson et al. (2015), who argue that CMPs have helped the sector take the issue of emissions seriously. Despite the advantages, there are some gaps in CMPs. They tend to focus on operational issues rather than strategic ones. Technical projects and details are dominant in CMPs with less emphasis on non-technical or human factors. Therefore, CMP looks like an internal estates' document rather than publicly facing. CMPs are less engaging and this might be because these are developed by environmental and technical managers in estates department. This makes CMPs complex and less effective in communication with stakeholders. In addition, carbon management strategies and plans do not seem to be integrated into other policies and strategies; rather they are a stand-alone document. There is also no evidence how CMPs compare with actual practices. CMPs face challenges such as future uncertainty and changes. Sometimes, it is difficult to predict the future scenario while developing a CMP. For example, increase in student numbers, weather conditions, policy changes and technological advancement. It is difficult to identify projects, as situation may change, for example changes in the HE sector may influence it. The evidence suggests that CMPs are not dynamic and appear to be static. Altan (2010), Lee (2015) and Carbon Credentials (2015) state that business growth and expansion of estate are the major challenges universities are facing. HE is unusual in the public sector where growth is seen as a positive outcome for business, but there needs to be consideration to how it may affect emissions (EAUC et al., 2015b).

The majority of the universities have developed policies, plans and strategies and have also measured emissions from scope 1, scope 2 and selected parts of scope 3. Most of the public sector organisations in the UK accept their leadership role and have been pursuing a range of policies and strategies over the last two decades (Birney et al., 2010). Universities are now in the implementation phase and statistical results depict that performance of universities varies significantly and the sector is a 'mixed bag'. Despite the policies and strategic plans, there is little 'real practice' occurring. 'Lip service' includes statements such as "to be seen to take a leading role in relation to carbon management"

whereas in reality, no such measures are taken. The terms such as ‘leading the way’ or ‘be a leader’ are overly used by many universities, but the question who is real leader is unanswered. There is a lack of carbon emissions measurement and strategy implementation in scope 3 related areas, which is regarded as challenging by university managers. Despite this, the majority of the managers believe that their universities are successful in managing emissions due to the effective carbon management practices. However, the situation is not ideal as there are managers who hold the opposite view, suggesting room for improvement.

Universities have shown commitment to reduce emissions and have targets to support the HEFCE and national targets. All of the sample universities have set targets, but CMPs do not reflect whether they have achieved actual reductions over a period of time as there is no sector study. However, setting high targets and not making a realistic effort to achieve them should be perceived as ‘green wash’. Robinson et al. (2015) argued that having unachievable targets can be harmful as middle managers may lose interest and support of senior leadership. Ambitious targets are less likely to be achieved and the problem is that realistic but relatively low targets can be criticised and penalised in league tables such as the UL. The majority of the universities have plans to meet absolute targets, which could be difficult due to energy intensive activities and business growth. Some of the managers have criticised absolute targets due to inherent contradictions with growth. This corresponds with Lee (2015) who argues that energy intensive research along with growing estates is counter-productive to carbon management. Spirovski et al. (2012) argued that rise in carbon emissions is due to the growth of university campus. However, a focus on carbon management in energy intensive research facilities is likely to achieve greater reductions in emissions than if teaching and office areas are focused on (Klein-Banai and Theis, 2013). In contrast, universities have relative targets for reporting and allowing business growth. It might be interesting to quantify if universities are successful in meeting absolute targets. However, the UK targets are absolute (HEFCE, 2009a). These targets are for scope 1 and 2 emissions; although some selected parts of scope 3 are measured by many universities. However, many universities are lagging behind in dealing with the measurement and targeting/management of scope 3. It might be because scope 3 is not mandatory and HEFCE has only advised to develop targets for scope 1 and 2 (HEFCE, 2010b). Universities do not have the data for all scope 3 streams for calculations. However, universities understand the important role of indirect scope 3; especially procurement and travel as these are discussed in CMPs. Ozawa-Meida et al. (2013) measured the carbon performance of DMU and found that scope 3 carbon emissions consist of around 79% of the carbon footprtint. Universities are trying to reduce scope 3 impacts on ad hoc basis.

CMPs reflect the notion that carbon management should start with senior management leadership. Millar et al. (2012) believe that sustainable management depends on the commitment of senior leadership. Senior management has at least started to realise the importance of carbon management as

a result of various drivers, as discussed in Chapter 2. Schultz and Williamson (2005) found that senior management in most of the industries have started to realise carbon-constrained economy. All of the CMPs are signed by a VC or any other senior manager in the foreword, but their role is limited in the process. Senior leaders not only need to have vision, but they need to ensure the implementation of the vision (Millar et al., 2012). Thus, there seems to be disconnect between senior management and middle management in carbon management process. The analysis suggests that strategic and operational aspects of carbon management are not joined up. Many universities have planned to adopt whole-organisation approach, but this might not be there yet and need strategic approach (Schultz and Williamson, 2005). Similarly, EAUC et al. (2015b) and Dembo (2008) argue that carbon management requires a holistic enterprise-wide response. The whole organisation approach constitutes students and staff in all faculties and directorates, both academic and professional services engaged in reducing emissions from the direct and indirect sources (scope 1, 2, and 3). In contrast, carbon management has started to emerge at the strategic agenda from policy and strategy perspective and CMPs could play a significant role in it. The majority of the managers in the survey reported that their senior management leadership is committed. This is a surprising result as compared to the content analysis and is backed up by the statistical evidence that the majority of the universities have integrated environmental sustainability (carbon management) into corporate strategy. This suggests that senior management has at least started considering it, as stated above. However, carbon management is not central to business activities and strategic decision-making due to lack of priority and focus on competing business demands such as research, education and student recruitment. In contrast, some managers reported that universities incorporate it into the strategic decisions. This is challenging and incorporating carbon management into strategic plans is as close to strategic carbon management as universities have conducted so far.

Funding and resources are an important part of implementing carbon management. CMPs suggest that there are different funding options available to implement projects and universities are using multiple sources. Some of the projects have got required funding and some are subjected to further funding approval as stated in the CMPs. Therefore, funding is considered crucial for the implementation. The survey found that there are sufficient resources available in universities for implementing strategies. In contrast, some managers argue that there is a lack of funding and they would need more funds to implement project, but universities experience competing demands for funding in the current tight financial climate in the HE sector. As far as HR is concerned, universities have environmental teams of differing sizes based on the organisational structure. Most teams have 2-5 members of staff with a formal remit (EAUC et al., 2015a). Some universities have lower number of staff in their environmental teams, which indicates a need for more human resources. However, the majority of the managers have knowledge and understanding for measuring carbon emissions and management. Stakeholder engagement is a key factor and aims to bring internal and external stakeholders together.

Universities are focused on staff and student engagement and the engagement of senior management is not addressed in CMPs. It seems that many universities have not been able to make CMPs an interactive tool to engage stakeholders. CMPs fail to make staff, students and other stakeholders understand what it means to them and how can they contribute to it. CMPs are not visible in universities. Universities seem to have embedded statements into CMPs rather than providing solutions to problems they are facing or their causes. Universities have different programmes to engage stakeholders (mainly staff and students). However, majority of the respondents reported that there is a lack of cross faculty and departmental motivation and ownership and the same was found in the content analysis. This might be due to their main job duties and responsibilities and there may be lack of interest or available time. The majority of the managers believe that the university communicates the targets, strategies and subsequent performance to all stakeholders. Despite this, staff and students do not seem to have much awareness and understanding of carbon management. This could result in lack of stakeholder engagement. Even though managers communicate this information, but staff and students might not be taking it seriously or contributing to the process.

There is a wide range of job titles for individuals responsible for carbon management. However, responsibility varies based on structure of the organisation and seems to be unclear. This matches with the findings of Chen et al. (2011), who state that responsibility of addressing the issue of climate change varies largely in universities ranging from the presidents of universities to environmental or sustainability coordinators. The overall responsibility varies and mainly rests with working or task groups consisting of individuals from different departments. The operational day-to-day responsibility lies with middle managers in estates, whereas strategic responsibility is with senior manager or director of estates who oversight the overall process. Currently, carbon management is seen as a responsibility of a specific department and/or individual in universities. Predominantly, carbon management is carried out by environmental teams in estates or facilities management departments, whereas other departments make little or even no contributions to such endeavours. This suggests that there is a lack of responsibility and management is disjointed and lacking in coherence and coordination. Middle managers do not have authority and involvement in strategic decision-making process and they need approval for most of the projects either from the directors or senior management team. This finding is same as that of Liu (2012) who argued that operational management staff are often based in a separate location from the planning department in universities and therefore, are less connected to the organisational decision-making process.

Universities review, evaluate and report performance on a regular basis through different forums. The survey found that universities review the process regularly and revise their strategic decisions as appropriate to inform the next stage of the process. Updating CMPs and tracking the progress against targets is part of it. This could help managers understand where they are and where they want to go in

future to meet the overall target. The review and evaluation process offers them lessons to be learnt for future. There are common external reporting mechanisms, but internal reporting varies. However, the reporting system could be standardised to compare universities against each other. Internal reporting system is emphasised in the CMPs, for internal stakeholders. There are legislative and government policy drivers for carbon reporting. By reporting emissions, universities can improve future performance against a benchmark and review CMPs. The fact that some universities have not updated their CMPs suggests that not all universities are effectively committed to carbon management. This indicates slow progress or managers being busy. Brite Green's (2015) research found that many HEFCE funded universities and colleges need to revise their CMPs to meet their 2020 targets, as universities need to scale up reductions (Carbon Credentials, 2015). Currently, there is a lack of consistency and complexity in various existing methods for measuring, targeting and reporting systems within HE and they are all different.

5.15. Conclusion

This chapter has presented the findings of the content analysis and survey. The content analysis of eighteen CMPs produced themes and sub-themes reflecting the current state and the carbon management approaches being employed by UK universities. The chapter has also assessed university levels of compliance and policy adoption. Some universities are well placed in the sector and some are in the initial stages of carbon management, i.e. 'mixed bag'. However, all of the universities are involved in carbon management to some extent and the presence of publicly available CMPs is an evidence of this. The survey explored the objective facts on themes identified in the integrated SCM framework and tested them in the wider sector. The survey findings complement or contradict qualitative findings of the content analysis. Qualitative data are insightful and useful, but, it does not give statistical representation of the opinions and demographics of the population. This is the reason that a quantitative survey is advised based on the initial qualitative data to provide statistical certainty to the qualitative dataset and findings (Vanek, 2013). This chapter has not only provided insights into the current state of the UK HE sector, but has identified gaps to be addressed, which are analysed further in the next chapter.

Chapter 6: Drivers and barriers to strategic carbon management

6.1. Introduction

This chapter presents results of the second part of the first phase research. Having explored the state of strategic carbon management (SCM) in the Higher Education (HE) sector through the content analysis of carbon management plans (CMPs) and the quantitative survey of the HE sector, this chapter examines in more depth through the interviews of key HE stakeholders. This chapter also explores the drivers and barriers to strategic carbon management. Seventeen semi-structured interviews were undertaken with middle and senior managers in universities and other stakeholder organisations in the HE sector including one email contact with the Chancellor of a university. A thematic framework for exploring the key SCM issues to be addressed is presented and lessons learned are discussed. The frameworks for drivers and barriers[9] are also presented. Discussion is presented and conclusions are drawn about the major challenges universities are facing with regards carbon management.

6.2. The interviews

The research adopted a qualitative approach to develop an improved understanding of SCM. The research was exploratory using semi-structured interviews to support a thematic analysis. A total fourteen universities were contacted via email and nine universities responded and agreed to participate. The participating universities are drawn from pre-1992 (four) and post-1992 (five) universities in England. The distinction between the pre and post-1992 universities is made to elaborate some of the challenges being faced by the two groups such as nature of business operations and estate. The results indicate some of their specific organisational issues. Keeping in mind the available time and resources, one interviewee was selected from each university to represent the organisation, apart from the case study university, where seven interviews were conducted. These seven interviews are shown in bold in Table 49. The interviewee was selected to discuss SCM issues, because of his/her primary role. The responses could be different from other people in the same university, however, triangulation with content analysis and survey is expected to validate the data and findings. A digital recording device and iPhone 4s were used for recording the interviews and hand written notes were taken.

[9] For drivers and barriers, the content analysis of CMPs is integrated with the interviews to avoid repetition in the chapter.

Interview No.	Job Title	Type of Interview	Type of Organisation
1	**Environmental and Sustainability Officer**	**Face-to-face**	**Post-1992**
2	Energy Manager	Face-to-face	Pre-1992
3	Energy Officer	Face-to-face	Post-1992
4	Carbon and Energy Manager	Face-to-face	Pre-1992
5	Sustainability Manager	Telephonic	Post-1992
6	Environmental Manager	Telephonic	Post-1992
7	**Transport Coordinator**	**Face-to-face**	**Post-1992**
8	Director of Estates & Buildings	Telephonic	Pre-1992
9	Director of Estates	Telephonic	Post-1992
10	**Head of Estates Management**	**Face-to-face**	**Post-1992**
11	**Deputy Procurement Manager**	**Face-to-face**	**Post-1992**
12	Head of Environment and Energy	Telephonic	Pre-1992
13	**Director of Sustainable Development**	**Face-to-face**	**Post-1992**
14	**Research Fellow**	**Face-to-face**	**Post-1992**
15	**Director of Climate Change Policy**	**Face-to-face**	**Post-1992**
16	Head of Sustainable Development	Telephonic	HE sector organisation
17	Chief Executive	Face-to-face	HE sector organisation

Table 49: Research participants with job title, type of interview and organisation

A total seventeen interviews were conducted with middle and senior managers in estates and facilities management departments of case study and other English universities (22 were approached but 5 did not respond). The other key senior individuals from the HE sector organisations in the UK were interviewed to gain sector level perspective. The interviews were conducted either face to face (eleven) or by telephone (six), depending upon the location and time commitments. The interviews lasted for between forty minutes and an hour. The Chancellor of a university was contacted via email, as a result of networking at an event, to take his views on the university's approach and the response was included. He was solely contacted to get board level perspective, which could not be easy in most cases as chancellors and vice chancellors are hard to access. Some informal discussions with key industry people also made part of the research. The analysis resulted in themes and sub-themes, which were used to populate a thematic framework. The themes and sub-themes represent the way of organising the findings in a systematic way.

6.3. Understanding of the term 'carbon management'

The issue of 'carbon' has grown over the last decade or so as a result of various policy drivers nationally and in the HE sector. This has made carbon management an umbrella term for dealing with various environmental issues, as discussed in Chapter 2. In the past, terms such as energy efficiency and environmental management were used and now, carbon management is gaining popularity.

Universities are attempting to manage their environmental impacts associated with energy, waste, water, travel and procurement through implementing carbon management. It might serve the same purpose of environmental management, but the term is now changed within the HE sector.

> *"If you look at 10 years ago, it was more on energy efficiency or environmental management and now everything is going towards carbon management and they all interrelate to the scopes 1, 2 and 3, so it is all bundling up into one carbon management. I think institutions can be more focussed whereas historically they would focus on either environmental management or energy management or waste management, but now carbon management brings all these together putting an overall roof over. So under carbon you are looking at environment, energy, waste, travel and so many things to bring together. That's how we should go towards; it's all similar things, the impacts are same"* [Carbon and Energy Manager]

The Chief Executive of the HE sector organisation agreed and added that carbon management has grown over the last five or six years.

> *"Carbon is something which as an entity has really grown over the last five or six years. When we started fifteen years ago, the agenda there was energy reduction, water reduction, waste reduction more sort of environmental management activities"* [Chief Executive]

Interviewees were asked to define 'carbon management'. While the term 'carbon management' is well understood by many practitioners, the interviewees defined it in different ways. However, there was agreement on the ultimate goal of carbon management to reduce carbon emissions arising from business activities of a university. Most of the interviewees described carbon management more of an operational process focusing on different sources of carbon emissions (scope 1, 2 and 3) and their management. This suggests that carbon management is considered as an operational process.

> *"Carbon management is managing the greenhouse gas emissions rising from the activities, products and services of the university, part of that, those emissions which university can control and those emissions which university can influence*" [Head of Environment and Energy]

> *"Carbon management means the identification of where we produce our carbon as a university so it could be across any of the scopes, so it could be scope 1, 2 or 3 and once it's identified it and then measure it and try to reduce it for whole variety of benefits, environmental benefits, monitory benefits, sort of efficiency of how the university actually runs, those benefits are there as well"* [Environmental Manager]

In contrast, two interviewees described carbon management beyond operational level and linked it with strategic and business management suggesting that it is a strategic issue. The Director of Climate Change Policy at a post-1992 university defined carbon management in a different way and argued that carbon emissions should be treated similar to finance and other resources in an organisation. This indicates that carbon management is a key strategic issue like others. In contrast, the majority of the interviewees did not relate carbon management to wider business management objectives.

> *"Basically it's incorporating carbon into a business' normal management practices, so instead of being an uncontrolled cost, it can be brought into normal business management processes and manage just like cash and resources, yes so it's integration of carbon into core business"* [Director of Climate Change Policy]

Overall, environmental managers in estates have better understanding of carbon management than other managers in estates, procurement and other departments.

Ethics of the issue

In regard to understanding carbon management, universities are getting motivated for it as they have started to understand the role of carbon management and 'ethics of the issue', i.e. environmental imperative of doing the 'right thing'. Four out of the seventeen interviewees consider carbon management as an ethical issue. Therefore, doing the right thing in terms of reducing emissions and impact on the natural environment is a key driver for these universities. In contrast, the interviews suggest that many of the managers do not appear to understand the ethical or moral implications of carbon management. Ethically, carbon management may not have received much attention as a driver. This is evident by only one CMP where it is stated that social and ethical responsibility is a driver for carbon management. This suggests a lack of ethical considerations and may be universities do not consider it important. In addition, one interviewee reported that staff and student motivation and passion for carbon management is a key driver, which could drive organisational change. Two interviewees stated that carbon management is a right thing/moral thing to do.

> *"It's the good thing; it's the right thing to be doing"* [Energy Manager]

Furthermore, four interviewees identified carbon management as an ethical issue and argued that lack of ethical considerations is a barrier to carbon management. The majority of interviewees did not mention this barrier and it may be because they are still not getting used to the idea of carbon management and its ethical implications. The Head of Sustainable Development said that sometimes it is quite difficult to know what the 'right thing to do' is.

> *"We have learnt not to value planet. We just think it can give us all the energy we need. We think it can cope with all the carbon dioxide that we produce. It will cope with the waste that comes into it. So we are talking about fundamental re-understanding of natural capital, how we value and price what we do"* [Chief Executive]

6.3.1. Is 'carbon management' a misleading term?

Two interviewees considered 'carbon management' a misleading term that could force universities to think that 'carbon' is the only sustainability issue. They argued that there are wider sustainability issues, which need to be addressed and managers might overlook those issues while implementing carbon management. Bhaskar et al. (2010) argue that sustainable development is largely reduced to a matter of CO_2 emissions and CO_2 is disconnected from the broader sustainable development agenda. Therefore, rephrasing the term 'sustainable development' and its relation with carbon management would be helpful for clarity. The Chief Executive argued that the agenda of energy, water and waste reduction and wider environmental management activities have grown enormously. This might not be enough and universities need to incorporate the impact of teaching, research and other sustainability issues in strategies.

> *"The agenda has grown hugely to include what we teach, how we research, how we make relationships with wider stakeholders, not only in our estate, having said that carbon has grown in profile very significantly in the last five or six years which is a good thing, but is also dangerous because it sometimes forces universities and colleges that actually carbon is the only agenda that they need to look at and that is not the case"* [Chief Executive]

Four interviewees reported that carbon management can mean different things to different people. The term can be interpreted in different ways and generates a variety of meanings. The Chief Executive argues that universities should not look at carbon management in isolation, suggesting a focus on overall sustainability. Carbon management is a part of sustainability, but universities need to be aware of other sustainability related issues as well.

> *"You cannot look at just carbon in isolation, you cannot look at environmental stuff in isolation, you cannot look at estates in university in isolation, you got to look at whole organisation. So the whole big picture, the whole institution approach and so many universities are putting environmental management systems which is good but it's not the big picture, if you just focus on carbon, you are missing the big thing"* [Chief Executive]

Similarly, the Transport Coordinator argued that sustainability is more than carbon footprinting and includes the social aspects such as creating a healthy and safe working environment.

> *"To me sustainability is about far more than just carbon footprinting. It's about creating a healthy and safe environment and carbon is only a part of that. I want to reduce carbon as much as everyone else, my concern is that we get bogged down only measuring carbon"* [Transport Coordinator]

During a telephone conversation, the Manager of HE organisation stated that *"it's not about carbon only. I do think it is probably misleading. It is used as a one major thing. It's about sustainability, but people don't get sustainability sometimes".* In contrast, nearly all of the interviewees consider carbon management as a strategic issue and the content analysis is evident that six out of the nine universities have incorporated environmental sustainability into their strategic plans. Carbon management is part of it. The content analysis supports this argument; eight universities (out of the eighteen) specifically mentioned carbon management or environmental sustainability as a strategic theme in corporate strategies, as mentioned in Section 5.6.2.

6.4. Senior management leadership

This factor explores the role of senior management leadership in universities and the extent to which senior management is engaged. Leadership from senior management is one of the most important components of carbon management process and was mentioned by fourteen out of the seventeen interviewees. In response to the Critical Success Factors (CSFs), the Research Fellow stated that *"I think yes, one of the success factors is the leadership and commitment at the top level".* The Chancellor of a pre-1992 university said that carbon management can only be embedded in a university if it is driven by a VC at a strategic level. If carbon management only exists in estates, then it is unlikely that there will be strategic buy-in at the top level required to drive change.

> *"The whole question about properly embedded carbon management only works if it is driven by the VC and by the whole of his/her team. If it is stuck in the Estates Department, and simply relegated to a matter of managing assets and infrastructure, then it's very unlikely that there will be the kind of buy-in that will be required to really drive behaviour change"* [Chancellor]

However, senior management commitment varies from university to university; but almost all of the universities' senior management commitment is reflected through their CMPs and other strategic documents. This suggests leadership at only policy and strategy level, but the success depends on the engaged leadership and commitment through the deployment of resources required for implementation and active participation. Throughout the interviews, the role of senior management leadership was brought up and discussed frequently as shown in the following extract of an interview with the Head of Sustainable Development at the HE organisation.

> *"I think it needs high level leadership and championing from either the vice chancellor or another member of senior management team"* [Head of Sustainable Development]

The above quotation states the role of senior management leadership. The Director of Estates stated that *"we need to lead by example".* Eight out of the fourteen interviewees mentioned that senior management is committed to carbon management, whereas six interviewees mentioned that there is a lack of senior management leadership and they presented this as a key barrier. Therefore, there may be a mix of approaches in the sector. Managers from three universities claim that their senior management is committed to carbon management, but they do not have evidence to demonstrate the commitment. An Environmental Manager considered the lack of senior management support as a barrier and a Research Fellow argued on the key role of senior management leadership for deploying resources and success of carbon management.

> *"Senior management is not allowing us to change something that could improve the carbon footprint"* [Environmental Manager]

> *"If there was a real commitment by the vice chancellor or by the director of estates, there should be more resources on that, you can compare these with the 'X', they really put resources money, human etc."* [Research Fellow]

The majority of the universities have senior management commitment in strategic documents such as carbon management plans and strategies. This is different to practical commitment for implementation. Almost all of the universities' CMPs are signed off either by a VC or a senior manager, but, as stated above, managers think that senior management is not actively committed. However, this indicates that senior management has approved the implementation of carbon management in the majority of the universities. However, this might not ensure their full engagement during the process and provision of resources. In contrast, funding and resources are allocated in CMPs for projects, which might reflect senior management leadership. Some of the interviewees mentioned that they are still trying to engage senior leadership. They argued that senior management teams are key stakeholders and middle managers need their strategic support for effective implementation. The Transport Coordinator at a post-1992 at DMU thinks that VC seems to be

engaged and considers sustainability agenda to be very important for the university business. However, this is not in the strategic framework anymore.

> *"Actually, I think the VC does believe in it. I think that he does consider the sustainability agenda to be very important, both to him and to DMU as a business. I think that he is doing it for the right reasons"* [Transport Coordinator]

The Head of Environment and Energy at a pre-1992 Russell Group university quoted that "*I think we have that, we have senior management centrally"*. Moreover, it was argued by one of the interviewees that every head of department and school needs to be engaged, particularly in universities where devolved administration exists. The departments in the devolved university have separate budget, so they make their own decisions rather than following the central decisions. However, this might not be the case in many other universities. The Carbon and Energy Manager at a pre-1992 university indicated a lack of senior management leadership.

> *"I think senior management is still perhaps getting used to the idea of carbon management and I don't know whether enough emphasis is actually given on the business decisions for carbon management"* [Carbon and Energy Manager]

The Director of Estates at a post-1992 university agreed with the Carbon and Energy Manager and stated that carbon management is not popular among senior management.

> *"The message goes to the corporate and senior management team. But the message is not popular"* [Director of Estates]

The Chief Executive believes that linking of capital funding with carbon management is helping, but still, carbon management is not high on VCs' agenda. He said that senior managers are mainly academics and only academic activities motivate them. Business performance in terms of carbon emissions is not high enough on their strategic agenda.

> *"Linking of capital funding is helping, but still at the end of the day I would say it is not high on vice chancellors' agenda. It's not, these people are broadly academics that is what drives and motivates them and the business performance in terms of carbon isn't really high enough up their agendas"* [Chief Executive]

The directors of estates appear to be more committed to carbon management than other executive members and in most cases; they are the people who are responsible for leading the environment team based in estates and facilities management department. This might be because of their direct link with the environment team and the work the team is doing. Moreover, it was interesting to explore that interviewees from DMU have varying views on senior management commitment. Another Environmental Manager mentioned that the university has a committed senior management, but the middle management lacks commitment. This is an important point to be noted that a middle manager in estates is being critical of the role of middle management. These middle managers can be from other university departments. However, this was not mentioned by any other interviewee and the criticism has been more on senior management commitment.

> *"I still think that even if senior management is really committed, but the middle management and all other areas need to be committed as well and we haven't necessarily got that and that's why it's not really easy"* [Environmental Manager]

In contrast, the Chief Executive at the HE organisation argued that middle managers are working in a difficult situation and are often restricted in estates department and have no authority over academics, deans and faculty leaders who are involved in decision-making. Middle managers indicate that they would need support of senior management, which they do not have currently.

> *"They are all working in a very difficult situation because they are often stuck in the estates. They have no relationship or authority over academics, deans, faculty leaders who basically rule the way the university really operates. So, they are trying very hard and are trying to motivate the students and helping them all to get involve"* [Chief Executive]

Two senior executives of the HE organisations gave their opinions that the cost of energy is linked with senior management commitment. These two HE organisations are kept anonymous. One of them, a Chief Executive, argued that the increase in the cost of energy has helped universities to drive carbon management because universities have been responding slowly. The other interviewee, Head of Sustainable Development, stated that the price of electricity is low and further increase will make a difference. This could have an effect on the engagement of senior management, because they will be concerned to save money from energy bills, so that they could invest in other business areas. Russell Group (and other pre-1992) universities seem to have higher electricity consumption and expenditure due to energy intensive research and as such could be a challenge. The Chief Executive reported that the increasing cost of energy has made it a higher priority for directors of estates, finance directors and senior managers.

> *"Universities are still slow to respond, so obviously the increasing cost of energy has helped because it has become a higher priority for directors of estates and the finance directors and that is motivating them because after salaries, the second biggest bill is obviously the estates and within that energy is very high priority"* [Chief Executive]

There are conflicting opinions on leadership of senior management. Despite this, the Head of Sustainable Development stated that influence from senior management has been fantastic in universities and they have given the required support which middle managers need. He added that the job of senior managers is challenging. Senior managers have a lot of conflicting issues to deal with at the same time, which might not be helpful for carbon management. However, middle managers should neither wait to feel empowered nor use lack of senior leadership as an excuse for inaction.

> *"I think influence from senior management has been fantastic and there is a case that other people's job looks easy until you have to do yourself. You know senior managers will have a lot of conflicting high level issues handling at the same time. So I think people shouldn't wait to feel this empower and all of that senior management has given the support that they need. I think people need to work what they have got and trying to build that support at the same time rather than using it as an excuse for inaction"* [Head of Sustainable Development]

6.4.1. Is carbon management a strategic process?

This section aims to explore if senior management leadership perceives carbon management as a 'strategic process'. Fourteen interviewees mentioned strategic aspects of carbon management and reported that carbon management is a strategic process in universities. The majority of these

interviewees, eleven out of the fourteen, agreed that carbon management is a strategic process in universities. They appear to believe this due to their policy and strategy documents. The Head of Estates Management at a post-1992 university responded that carbon management is an integral part of strategic plan, so it is strategic. This could be different in reality, as people seem to believe that carbon management is a strategic issue if it is part of a strategic plan or corporate strategy.

> *"Yes I believe so, that's backed up by the fact that it's an integral part of the strategic plan now"* [Head of Estates Management]

The Sustainability Manager at a post-1992 university agreed that carbon management is a strategic process due to the HEFCE policies and other drivers. HEFCE driver might be weaker now as the balance of power has been shifted from the funding council to students after the increase in tuition fees. This raises a question mark on the future role of HEFCE. Furthermore, he argued that it is a key strategic element, but obviously there are so many other strategic elements in universities. So carbon management will always be competing against other strategic issues to a certain degree. The response of the question if carbon management is strategic in the university is:

> *"Yes definitely it is, it has to because the HEFCE targets and things we have to meet, it is strategic, it is probably, it is a key strategic element but obviously there are so many strategic elements as well. So it's always going to be competing to certain degree"* [Sustainability Manager]

The Head of Environment and Energy at a pre-1992 Russell Group University argued that carbon management is a strategic process.

> *"Because we have a carbon management plan, we have a project board chaired by the Pro-Vice Chancellor of institutional affairs and have representatives from across the university and it's not just a thing within estate management"* [Head of Environment and Energy]

The Director of Climate Change Policy argued that when carbon management came along, organisations considered carbon management as an entity that needs to be managed separately while running the organisation. It is suggested that universities have to integrate carbon into their strategy indicating that carbon management needs to be a part of strategies and policies.

> *"Before carbon management came along, people thought of it something that you have to run a company effectively and you have to manage carbon over here separately, so that's not going to work, you have to bring carbon into the strategy of the company"* [Director of Climate Change Policy]

In contrast, one interviewee argued that carbon management is not currently a strategic process. The Chief Executive of the HE sector organisation stated that it is not really a strategic process and is only a part of estates, which is in contradiction with the argument presented above by the Head of Environment and Energy.

> *"At the minute, it's something which lives in estates ok"* [Chief Executive]

The Deputy Procurement Manager at a post-1992 university was asked if carbon management is one of the strategic issues in procurement process.

> *"No, to be honest, it will be there in terms of one of the sustainability questionnaire, but I don't think"* [Deputy Procurement Manager]

Two interviewees reported that carbon management is both strategic and operational process. University managers seem to believe carbon management as a strategic process, if it is a part of strategic plan or other strategic documents. Then, it comes to implementation, which makes carbon management day-to-day operational process.

> *"I think ultimately it comes down to operational day to day but it's got to hang on at the back of strategy, it's not you doing a piecemeal. Delivering wise it's operational day to day but it is supported by the delivery plan or strategy of what we are trying to achieve"* [Energy Manager]

Aspirational drivers

In a journey to be strategic, universities have aspirations. According to the strategic plans and CMPs, many of the universities have a vision to be a sustainable or low carbon university and be a leader in the sector and beyond, as discussed in Section 5.6.1. A vision to achieve low carbon leadership is a driver to reduce emissions for some universities. The university may provide best practices and lessons to other universities. No interviewee reported it as their university's carbon management driver, but two of the managers reported that 'kudos' for environmental and carbon management is a major driving factor for them suggesting that aspirational drivers are not very important. However, it may be a driver, but not very strong. The following quotation presents an example of an aspiration to be a leader.

> *"To be seen to take a leading role in relation to carbon and energy management issues will enhance the university's image and reputation"* [X University]

6.4.2. Strategic decision-making

Strategic decision-making can have an impact on carbon management process and could demonstrate senior management leadership. Strategic management of carbon may provide an effective approach to strategic decision-making processes in business organisations (Deloitte, 2013). Eleven of the interviewees mentioned making strategic decisions around carbon management; whereas four of the interviewees agreed that carbon management should be considered in strategic decision-making process. This suggests that, at present, carbon management is not integrated into decision-making and the emphasis is more on incorporating it in future. The Head of Sustainable Development at the HE sector organisation argued that carbon emissions should be considered in all of the university decisions and universities should think of carbon implications of strategic decisions and management. However, it could be a difficult situation for decision-makers if carbon considerations contradict with any of the competing core business activities. There could be a challenge to have a balance of both.

> *"I think carbon should be considered as part of every significant business decision and about what are the carbon implications of this course of action"* [Head of Sustainable Development]

Eleven interviewees described strategic decision-making as an important factor, as every decision has carbon implications associated with it. They reported the role of decision-making, but they did not mention if carbon management is part of decision-making process in their universities. The Chief

Executive was not sure if currently enough emphasis is given to carbon management in decision-making, so he also encouraged universities to filter strategic decisions through carbon management. It was argued that universities are engaging students and raising awareness, however, this agenda needs to be core part of the whole organisation.

> *"Universities getting students involve, that is good and raises awareness, but until this agenda makes its way right up into the DNA of the organisation and is used, there is a carbon filter through which every decision of the university is put through"* [Chief Executive]

The same applies to procurement decision-making, where carbon management does not seem to influence decisions and no one has concentrated on low carbon procurement according to one of the research participants. The Deputy Procurement Manager at a post-1992 university was interviewed and it was explored that the progress is slow in integrating carbon management into procurement and the decision-making process is quite unclear. Four interviewees mentioned that middle managers can only advise senior management team which makes final decisions in universities. The Carbon and Energy Manager mentioned that carbon management does not have priority at strategic level.

> *"We are advising university what needs to be done in terms of carbon, how to reduce the carbon impact, but the decisions actually rest with senior management"* [Carbon and Energy Manager]

The above quotation indicates that middle managers have advisory role, indicating that they do not have involvement in strategic decision-making process. Therefore, VC and senior management has a main role to embed carbon management into decision-making, as it must be driven from the top.

Estate development and business growth

Estate development and business growth are critical issues because universities are growing in their business and they have to develop infrastructure as part of estates. Due to this, the volume of research, teaching and student numbers is increasing. The growth in estate size and business, as a result of strategic decisions, is producing more emissions, because of facilities, departments and laboratories etc. In the content analysis, twelve of the CMPs highlight the issue of institutional growth and its impact on carbon management. Therefore, universities are trying to manage emissions with the growth and it is a challenge to manage the balance between the two. There has not been any evidence in the discussions and CMPs on how universities are planning to deal with such issues. Growth is a common phenomenon among many small and large universities and continuous business growth and expansion in its infrastructure seems to be in contradiction with the principles of carbon management. Energy consumption and subsequent carbon emissions have grown significantly as a result of this overall growth. Additional buildings and infrastructure to meet the demand, is a major cause of increasing emissions. Two of the universities, the University of Derby and Cardiff University, quoted on the key issues of increase in student population and size of estate. The data from the content analysis is used in this section to avoid repetition.

> *"We have also experienced a steady increase in the student population and to reflect this and the changing size of the estate* [University of Derby Carbon Management Plan, p. 7]
>
> *"Cardiff is set to continue the expansion its estate and an increase in capital spend is expected in the coming years, in common with other Russell Group universities*" [Cardiff University Carbon Management Plan, P.9]

Three out of the seventeen interviewees mentioned it as a barrier and argued that it is hard to manage a balance between carbon management and the growing business activities due to its conflicting nature, as discussed in the above section. An Environmental Manager of a growing post-1992 university argued that the university is growing, as other universities. With growth, staff and students want more facilities resulting in higher emissions.

> *"You are constrained by the fact that the sector is still growing, as I say we are a relatively new university and we are still growing, so that constraints you because people want to do more things and have more equipment and more laboratories, so when people want more things because the university is growing, obviously the carbon emissions associated with those things increase as well, so I guess that's a tricky thing from our perspective"* [Environmental Manager]

In contrast, three universities mentioned that they still have done well in carbon management, despite the continuous expansion of the campus and business growth. This indicates that universities can implement carbon management successfully with business growth, which is a key to sustainable business.

> *"The most notable success to date is achieving an absolute reduction in our carbon emissions since 2005/06, despite expanding our campuses and increasing student numbers. This is a challenge that many other HEIs are struggling to meet and provides an excellent platform for on-going carbon reduction success"* [University of Lincoln, Carbon Management Plan, p.5]

Conflicts and core business priorities

Universities are working on carbon management in addition to the core business (Section 5.6.3). It may be difficult to implement carbon management with competing core business priorities. According to the two interviewees, carbon management is not prioritised over the core business activities in strategic decision-making in their universities. This suggests that carbon management is not considered to be aligned with core business and disjointed approaches exist. Furthermore, two of the interviewees (one senior and one middle manager) expressed their views on how carbon management has lost its inertia in other core business priorities and it is hard to put necessary resources in a financially tight situation of the HE market. They argued that carbon management can disappear in other pressing business issues in universities indicating that carbon management does not have a priority due to 'core business' - getting more students bring money, so it is seen as worthwhile and return on investment is quick. In addition, the survey found that majority of the universities are facing this issue and universities have not been able to manage the conflicts. At present, when HE is market driven and going through many changes, it could be put aside.

Lack of priority to carbon management could be due to strategic conflicts, as there are a series of conflicts between carbon management and the core business activities. For example, internationalisation, business travel, students experience and out of hour's opening of facilities etc. are the main ones, which came up as a result of the study. Senior managers, who are the main decision-makers, have to handle these issues at the same time, which is the main business focus. The potential conflicts and priority to the business was reported by the Head of Environment and Energy.

> *"I think another one of the challenges particularly in business travel is this tension between perceived need to travel in order to meet the research and academic objectives to the university and trying to reduce emissions from travel, once again I think it comes down to raising awareness, is there a need to travel, not assuming that all travel is bad"* [Head of Environment and Energy]

The Energy Manager argued that the university needs to invest in buildings and capital projects, but the budget has been tight because of investment in other areas. Due to this, there is a matter of competition between carbon management and other business areas. The Head of Environment and Energy at a pre-1992 Russell Group university identified tensions between business travel and carbon management. He did not perceive that all types of travel are bad due to their benefits to the university. This suggests that universities may not cut their business activities purely due to carbon management. The Director of Estates and Buildings argued that universities are working in a very different environment now. Carbon management does not have a priority and it is considered as an important issue, but not urgent in decision-making. Therefore, focus remains on the core business due to a lack of strategic drivers such as HEFCE or national government drivers.

> *"I believe because higher education sector is now in such a different position now that it has ever been, I don't think it has been considered as the aimed priority, may be important still, but it's not urgent"* [Director of Estates & Buildings]

6.5. Funding and resources

Funding and resources are critical for universities to implement carbon management strategies. The implementation of energy and carbon reduction projects requires considerable financial investment. The majority of the interviewees, twelve out of the seventeen, mentioned the issue of funding and resources. However, resources mean mainly HR in this section. There were two contradictory arguments presented by the interviewees. Twelve out of the seventeen interviewees declared that funding is important for implementing carbon management strategies, whereas three of the interviewees argued that funding tends not to be a problem for implementing the strategies. The first and foremost barrier to carbon management is a lack of funding because thirteen out of the sixteen interviewees mentioned funding as one of the major barriers, but, in contrast, the same three interviewees argued that it is not a barrier. They believe that it is perceived to be a barrier. The Sustainability Manager at a post-1992 university argued that carbon management is about implementing projects and for that, universities need funding.

> *"I think a lot of it to do with coming up with projects and then having the funding to be able to put projects in place really, so a lot of it is to do with getting funding actually, so we have*

> *funding from various different places to do different projects. We would struggle if we haven't that funding, yes, so getting funding is important"* [Sustainability Manager]

The other group of the interviewees argued that funding should not be a problem for implementing strategies. There are low and no cost measures related to behaviour change and engagement. These low hanging fruits could be utilised as one of the first options for carbon management. An Energy Manager at a pre-1992 university was asked if he thinks that funding is the main element to implement carbon management?. He replied that *"it's perceived to be the main thing".* The Director of Climate Change Policy at a post-1992 university supported this argument and went on saying that funding should not be an excuse of middle managers for inaction. Funding is important for large-scale projects, but low and no cost small-scale projects could have significant contribution.

> *"The money is important because energy efficiency tends to be capital intensive, so of course it's important, but it tends not to be the problem in most cases"* [Director of Climate Change Policy]

> *"It's presented as a barrier many times, but it's not as bigger barrier as you think, it's not you know you can probably find finance to do something"* [Director of Sustainable Development]

Universities have multiple internal and external sources of funding available to them. Most of the universities have ring-fenced internal budget for estates to invest in carbon reduction projects and they also utilise external funding sources. The sources of internal funding include tuition fees, commercial income, properties disposal and maintenance budget. The external funding sources could be capital funding from the HEFCE, Revolving Green Fund (RGF), Salix Finance Ltd. loans and recycling fund, funding from the research councils, renewable energy incentives and charity donations. The construction and maintenance budget can serve dual purpose, carbon reduction and new construction/refurbishment. The Head of Sustainable Development described these sources of funding and argued that there are a lot of funding opportunities.

> *"They have got their own resources of course which include loans, charitable donations and so on, money from the research councils, properties disposal, commercial income, those sort of things, they got income from the student loans, companies paying students' tuition fees, income from international students fees then they got a blend of money. There is also money available from Renewable Heat Incentives and Fee-in Tariffs as well, so there are quite a lot of opportunities"* [Head of Sustainable Development]

The Head of Environment and Energy supports the above argument and states that the university has received RGF grant from HEFCE and Salix. The university has also put aside £2M for projects. This indicates that universities are not only using their own capital budget, but also getting funding from external sources.

> *"We have a Revolving Green Fund grant from HEFCE and Salix and the University also puts aside £2M a year for energy related carbon reduction projects"* [Head of Environment and Energy]

However, the Sustainability Director at a post-1992 university argued during LinkedIn conversation that *"a marketing team gets given a marketing budget to keep things up to date; many universities do*

not have a carbon fund for getting on with routine work". This indicates that many of the universities lack a dedicated budget for carbon management. An Energy Manager at a pre-1992 university argued that carbon management funds can compete against internal budget for important core business activities such as teaching and research. The Energy Manager contradicted the argument of the Director of Climate Change Policy and mentioned that it needs heavy investment to deliver carbon management. Currently, the university seems to gives low priority to carbon management and might not be in a position to invest heavily on it, as investment is also needed in other core business areas. The Energy Manager argued that heavy investment is needed to deliver carbon reduction, but the university has other priorities which cannot be sacrificed. The university aims to invest within limits, however, the priority remains with the core business.

> *"At some stage big numbers as in millions of pounds need to be invested to deliver the tones of CO_2. What the university has said that in delivering the targets and delivering the sustainable campus, they won't bankrupt the university"* [Energy Manager]

The Director of Estates and Buildings quoted that only heavy capital investments will help universities to deliver their targets.

> *"There will come a time where only large investments will get us at a target we need to get to"* [Director of Estates and Buildings]

The study illustrates that universities have funding and resources available to them. In contrast, some interviewees argued that more funds could facilitate the process. Universities seem to allocate limited funds for projects due to their limited budget. The Head of Estates Management at a post-1992 university explains the financial situation and argues that the university has finite amount of budget and has to deliver the core business. Therefore, carbon management project needs to have a strong business case.

> *"The university has only finite pole of money, so they got to deliver their core business at the end of the day, which is teaching. If I was being realistic, then the way to improve our performance in terms of carbon management is to divert more funds towards the various carbon management plan initiatives. We as people who are responsible for delivering the environmental agenda are just one of the people that are shouting for more money to help us do that"* [Head of Estates Management]

Energy prices and cost savings as a driver?

When it comes to finance, universities want to save money for financial sustainability due to tight financial situation. This is a key part of the UK government's strategy and the HE White Paper 2016 (Department for Business, Innovation and Skills, 2016). Carbon management has an impact on financial and resource savings. According to the majority of interviewees, energy prices and subsequent cost savings emerged as the most important driver for carbon management. There is high variability in energy prices and volatility of energy market exists. Energy prices have been on increasing trend (Martiskainen, 2007), which may limit funds towards the university's core business. Therefore, carbon management may help in reducing business cost by minimising the risk of increased energy bills and use of resources. The majority of the interviews, thirteen out of the

seventeen, mentioned that cost savings is one of the drivers. This suggests that both energy prices and cost savings are financial drivers, which are important in the changing face of the sector. The cost can be in terms of high energy bills and its savings. An Environmental Manager at a post-1992 university supported this:

> *"Reducing cost because fuel prices continue to go up, we want to try to minimise the risk of increase of fuel cost, so cost is an important one"* [Environmental Manager]

Similarly, the Chief Executive argued that the only driver for carbon management is money and he argued that ethics of the issues does not work. It is the cost which drives universities to implement carbon management. He reported that cost and legislations have main impact on universities.

> *"I fear the only real driver that works is money. For many years, we have tried to sell the value of energy efficiency when energy was relatively cheap, wasn't the issue it is now. It is the right thing to do, think of your grandchildren, doesn't work enough, works for some, but it is not going to bring the change that we need. So in the end of the day, it's going to be the cost or legislations"* [Chief Executive]

The Head of Sustainable Development recommended higher prices of electricity to encourage carbon reduction and argued that significant increase in prices could be helpful. An increase in electricity price would cost universities more in energy bills. Therefore, universities will attempt to save energy and emissions suggesting that cost is a key driver and this is due to universities being operated as business organisations aiming for more profit in a competitive market. The increased surplus can enable universities to deliver student experience through investment in our infrastructure and staff.

> *"By cost of energy, I am particularly talking about electricity where I think significance increase in price of electricity would be helpful"* [Director of Sustainable Development]

6.5.1. Human resources (HR)

Four interviewees mentioned resources as HR and their skills to implement carbon management strategies. HR seems to play an important role in the carbon management process and this involves knowledge, skills and experience of middle managers who are responsible for implementing it. The Research Fellow emphasised the role of technical knowledge of operational staff:

> *"Other factors are also technical knowledge, may be the operational people also need to have good communication and to really implement the projects"* [Research Fellow]

There has not been much focus and discussions on the role of HR in embedding carbon management in universities. There is a lack of HR in universities and middle managers seem to have more responsibility in their job descriptions. The Director of Climate Change Policy stated that carbon and energy management is part of an energy manager's job, but he also has to deal with managing facilities and estates related issues. This indicates that an energy manager has many duties in the job description and more HR support would be helpful.

> *"You normally have an energy manager, he needs to do his job, but his job tends to be much broader than just carbon, he has facilities to manage, estates to manage and carbon. So he has to integrate carbon management into his normal job which is already difficult, so he needs support, he needs resources to help him do that"* [Director of Climate Change Policy]

Seven interviewees presented 'resources', including HR, as a barrier. All of these interviewees' emphasised the importance of resources and in contrast, one of them mentioned that it as a smaller issue than others. The interviewees argued that their universities need more resources including HR. Despite limited HR in estates and facilities management departments, the middle managers are motivated than other managers in different departments. They seem to have more commitment towards carbon management. But, the seven interviewees reported that there is a lack of HR and they need more resources to deliver carbon management. This indicates that HR has a key role to deliver carbon management.

> *"We need more resources, human resources as well"* [Research Fellow]
>
> *"For delivering the projects, you are going have to people to deliver it. So staff resources are equally important, but not just the staff, but they are going to have to be expert in the field or relative expert"* [Head of Estate Management]

In addition, four managers mentioned a lack of time as a barrier to carbon management. The time may be considered as a resource. University staff are busy in their jobs and they consider carbon management as an extra item to deal with. They are mainly focused on their primary role and responsibilities, which have been officially assigned to them as part of job description. The Deputy Procurement Manager at a post-1992 university mentioned a lack of both resources and time to manage carbon emissions in the procurement department.

> *"We don't have time and resources to manage the little tasks, so it's changing the mind-set or educating people to look at these aspects"* [Deputy Procurement Manager]

An Energy Manager at a pre-1992 university contradicted the above argument and stated that the university has a strong team in numbers and skills. However, this is not the case in every university.

> *"I think within the HE sector, we have got fairly strong team both in numbers and skill base, so we have a team to deliver carbon"* [Energy Manager]

6.6. Planning

Universities in England are required to develop individual carbon reduction targets, strategies and carbon management plans (CMPs) for addressing scope 1 and 2 emissions (HEFCE, 2010a). All of the nine universities have developed CMPs, which are focused on key themes related to technical and change management issues. The majority of the themes discussed in CMPs are similar organisational issues. The majority of the CMPs are publicly available on university websites, but there is only one university that has provided restricted access to only staff and another university has only put a summary on the website. The universities appear to be leading in their planning process, despite having some gaps in the CMPs. Three of the nine universities are in the process of updating their CMPs to measure their performance and include future strategies. There is one university where the academic faculty plans have a separate section on environment and sustainability issues and it seems to be a good practice, which does not exist in majority of the universities. The Head of Environment and Energy states on the planning:

> *"We have a carbon management plan as you know universities do with a carbon reduction target and we are currently very much focussing on scope 1 and scope 2 emissions"* [Head of Environment and Energy]

The Head of Environment and Energy argued that the university needs an evidence based strategy and CMP that has buy-in from all the stakeholders. The departments such as procurement, finance and estates need to be part of the planning process.

> *"I think it's about having a strategy and plan in place that's based on evidence that has buy-in across the university from all the key players and senior managers to people working in the area that can have an influence, lot of people in procurement, finance, estates departments etc. Its' about having an idea how you are planning to move forward and meet targets"* [Head of Environment and Energy]

The interviewees were asked about the effectiveness of CMPs based on their experiences. There was a difference of opinions on this particular issue. The majority of the interviewees reported that universities have been fairly successful in their plans. Based on his experience, the Head of Sustainable Development at the HE organisation mentioned that universities are quite structured in their strategic planning and have started taking carbon management seriously and CMPs have been helpful to reduce emissions.

> *"Yes, I believe so, I think so. I would probably like to be more certain about that actually. I will make it my business to ask few people. I am fairly confident they have been helpful"* [Head of Sustainable Development]

The Director of Estates at a post-1992 university added that CMPs have given the sector a common language of measuring, managing and reporting emissions. This could help promote consistency in the sector.

> *"Yes, carbon management plans are making progress and they are pragmatic. We also have a standard sector language"* [Director of Estates]

In contrast, three interviewees criticised some aspects of CMPs and mentioned gaps. One of them argued that CMPs are a good start and help in getting the recognition from senior leadership and stakeholders such as staff and students. The content analysis suggests that CMPs have a lack of flexibility and there seems to be uncertainty associated with future changes in universities. CMPs are developed with future predictions about student numbers, provision of facilities and the projects, but there may be a lack of accuracy in predictions. If any of these indicators change and are not planned well, there could be a problem in meeting the plan.

> *"The problem with carbon management plan is you write it at a point in time and try to predict what's going to happen over the next few years in terms of student numbers and new buildings and other things, but you can't predict accurately, so things happen and decisions are made that you didn't know at the time when you wrote it, so yes things change, so it's difficult"* [Environmental Manager]

To explore further, the Founder and Key Account Manager of an environmental consultancy working in the HE sector was asked through LinkedIn about the role of current CMPs and the potential gaps.

The vast majority of the 1st round of HE CMPs (circa 2009) is not remotely fit for purpose and many would require a serious amendment to the laws of physics for them to deliver as predicted. Most reduction projects identified suffer from being arrived at via by walk-round surveys (mostly funded by Carbon Trust) that did not measure anything – and many of them were several years out of date. [Dated: 07/11/2014]

6.6.1. Operational boundaries

Universities have measured carbon emissions from their business activities and set targets. They have started to monitor energy and fuel consumption and calculate carbon emissions, as found in Section 5.8.1. Carbon measurement or footprtining is a key to benchmark carbon management performance. Unexpectedly, there were two senior executives of the HE organisations, who mentioned monitoring and measuring emissions as an integral part of the process. This could develop a benchmark to set targets and compare the on-going performance of carbon management. However, more emphasis was on the boundaries of emissions measurement and management. The interviewees were asked about their universities' approach to carbon management. Five interviewees only mentioned scope 1 and 2 carbon management whereas fifteen interviewees discussed challenges around scope 3 carbon management even if they are not effectively managing these emissions. The majority of the interviewees discussed that scope 3 carbon management is coming on universities' agenda, but it is not done yet. The Director of Estates quoted *"scope 3 is a starting headline"*. The Sustainability Manager explained the boundaries of carbon management in his post-1992 university and indicated a lack of policies for scope 3.

> *"We predominantly have been focusing on scope 1 and 2 at the moment. Scope 1 and 2 are most important for us in estates and it also gives us best payback in terms of spending money. It's the thing that we have target set from HEFCE. The mandatory targets are for scope 1 and 2 only, whereas scope 3 is not mandatory, also scope 3 is more difficult to tackle"* [Sustainability Manager]

Currently, universities are mainly focused on scope 1 and 2 emissions in their carbon accounting, targeting and management plans. However, the majority of the interviewees did not explicitly mention this in their discussions. An Energy Manager supported this finding by saying that *"At the moment we are only looking at scope 1 and 2"* and the Carbon and Energy Manager said that *"we are trying to reduce our scope 1 and 2 footprint".* Scope 1 and scope 2 consist of direct and indirect sources of emissions, where the data seems to be readily available to calculate total carbon emissions. Universities can control their direct sources of emissions and this is the reason that these emissions are being dealt in a better way. The Director of Estates at a post-1992 university stated that *"reality is focus on scope 1 and 2 and it makes sense but scope 3 is not easy".* Fifteen of the interviewees discussed their plans and approaches to scope 3 emissions measurement and management. These are indirect carbon emissions where universities currently do not have targets and plans in place, because not all universities have measured these emissions yet. There are some universities that have measured selected parts of scope 3 emissions, which are mainly arising from waste and water. This is because waste and water is relatively straight forward and the data are available. The Sustainability Manager at a post-1992 university quoted:

> *"We haven't done very much of scope 3 at the moment. So we have been focussing predominately on scope 1 and 2 up to this point"* [Sustainability Manager]

It seems that different universities are undertaking measurement and management of different parts of scope 3 based on the availability of data. There is only one university, DMU that has done complete analyses of its scope 3 emissions, as stated by the Director of Sustainable Development. At present, most of the universities seem to be monitoring scope 3 data and they do not have effective management strategies and procedures. In general, universities seem to be at initial stages in terms of scope 3 carbon measurement and management. It is considered challenging in terms of data and universities are first trying to collect the data for its correct measurement.

> *"Everybody is new to this, scope 1 and 2 people are familiar with it and they use it on a day to day basis, so they are familiar with the type of emissions they are dealing with. Whereas scope 3 is little bit more complicated, its challenging in terms of data"* [Carbon and Energy Manager]

There are barriers to scope 3 carbon measurement and management, which are more around data management. It is argued that once universities have good quality of data and have measured their scope 3 emissions, then they can set baseline and targets with carbon management strategies. Universities do not have scope 3 carbon footprint and targets, but they have been undertaking some measures to reduce these emissions. The Director of Estates and a Sustainability Manager commented on the major barriers to scope 3.

> *"It is hard and you have to make assumptions. Trying to achieve the data is impossible and you need to make some sensible judgements"* [Director of Estates]

> *"Obviously scope 3 is not mandatory and I guess that's why scope 3 is more difficult to tackle. I think that's predominantly why we have looked at scope 1 and 2 basically, because we can control scope 1 and 2 within the estates department, but yes we have started to look at scope 3"* [Sustainability Manager]

The above statements support the argument of universities not effectively measuring and managing scope 3 emissions due to lack of availability of data to calculate these emissions. Scope 3 seems quite a challenging task for managers. Furthermore, if universities have calculated parts of scope 3 emissions, it involves rough estimations and assumptions, which might affect the accuracy of carbon footprint of a university. However, universities have started to focus on tackling scope 3 emissions. The other issue is that scope 3 is not mandatory and moreover, it might not have huge direct financial incentives, whereas scope 1 and 2 has direct financial benefits by saving the energy bills. Initially, HEFCE proposed universities to commit to making reductions in scope 3 emissions. HEFCE also advised universities to monitor and report scope 3 emissions, including the measurement of a baseline and setting targets (HEFCE, 2010b), but the sector missed this deadline and the policy seems uncertain about it.

Despite the barriers associated with scope 3 measurement and management, the sector seems to be making slow progress. Universities appear to be tracking their indirect emissions due to the impact

and reputational reasons. The HE sector has made some progress, but there is a long way to go. The Head of Sustainable Development at the HE sector organisation noted:

> *"The measurement of scope 3 carbon emissions is quite difficult. I think we have made really good progress on that and in some way the sector is a bit of an exemplar to that of how to tackle the measurement of scope 3 carbon emissions, but we still got a way to go"* [Head of Sustainable Development]

The above quotation indicates that the HE may offer some lessons to be learnt. The interviewees were asked if universities can influence scope 3. Seven of the interviewees agreed on universities' influence on scope 3 emissions. For example, an Environmental Manager at a post-1992 university explained:

> *"Yes, we have, our turnover is a couple of hundred million pounds each year. We spend a lot of money. We don't spend all of that, but we spend a lot of that and the supply chain is very big, so we have a huge influence of what we buy. We tend to buy different things to reduce our supply chain emissions. We could have an impact on how our staff and students commute to the university and obviously change our commuting footprint and also our business travel footprint. We could change the way we process waste, so footprint from our waste within our landfill sites or recycling plants could change. There are lots of different ways"* [Environmental Manager].

A Sustainability Manager agreed that universities can influence scope 3 and proposed that they can have more impact through collaborative working with other organisations and regional procurement consortiums.

> *"That's a difficult question. Yes I think possibly we can. I think if we are working together with other institutions, other universities we can have more of an impact if we work together with other universities and our procurement consortium, we are all part of procurement consortia, if we can work through those consortia then I think obviously we will have a more impact. I think working on our own is tricky to have an impact, but working together potentially we could have bigger impact"* [Sustainability Manager]

Three interviewees gave their perspective on travel emissions. The Chief Executive stated that universities are not focused on transport and travel emissions, as they have not looked at carbon aspects of it. The Chief Executive went on saying that overseas student travel is challenging and is in conflict with internationalisation strategy. Universities might not want to ignore the international student market only to save emissions. There are financial reasons and sustainability benefits of having the international students. The Head of Sustainable Development argued that 'overseas travel' including international student travel and business travel is complicated. He suggested that there needs to be a systematic analysis for all of these travel related emissions.

> *"I think overseas students are a bit of tricky one. Perhaps I should say overseas travel because that includes staff going to conferences and stuff like that. I mean I think at the moment people take sort of the view that affect the emissions, but I have never seen any sort of systematic analysis to that, I think we should take as a kind of value judgement"* [Head of Sustainable Development]

To produce insights into the issue of scope 3 carbon management and its barrier, Table 50[10] presents a dialogue between the Researcher (the Author) and Head of Environment and Energy.

Researcher: Have you integrated scope 3 emissions into the carbon management plan? **Head of Environment and Energy:** Yes, although our work on scope 3 is not as advanced as scope 1 and scope 2. **Researcher:** What do you think are the main problems or hurdles for the university? **Head of Environment and Energy:** The main problem in terms of managing scope 3, I mean we the university has a travel plan and therefore, there are various initiatives to encourage people to travel sustainably to work. I think one of the challenges is around measuring scope 3 emissions in the first place and then be able to identify what interventions will help reduce those and to what extent particularly around procurement and business travel. I think another one of the challenges particularly in business travel is this tension between a perceived need to travel in order to meet the research and academic objective to the university and trying to reduce emissions from travel. Once again, I think it comes down to raising awareness, is there a need to travel not assuming that all travel is bad. I think if there is a need to travel and there is no need to travel and is there a low carbon way of doing that. **Researcher:** Are you accounting international students travel and business travel? **Head of Environment and Energy:** Not yet, we have done some work on our business travel and particularly around our flights in terms of trying to calculate that. We have plans to measure that over the next few months. **Researcher:** What else have you measured in scope 3? **Head of Environment and Energy:** We have water in terms of decent figures and air travel, air business travel business travel by air. We are beginning to work in other areas.

Table 50: Interview extract demonstrating scope 3 carbon management

6.7. Carbon reduction targets

Section 5.9 found that all of the universities have set targets. All of the nine universities, where participants were interviewed, have also set targets for 2020 and 2050 in response to the national and the HE targets. The targets vary; some of the universities have very ambitious targets, whereas some of them have relatively less ambitious targets. For example, a pre-1992 university has 60% reduction target by 2020, based on scope 1 and 2 emissions. An Environmental and Sustainability Officer stated that the university has adopted the same targets as that of HEFCE.

> *"Currently the carbon management plan and reduction targets are only based on scope 1 and scope 2 emissions. The targets in carbon management plan reflect the sector wide targets, the HE sector targets which were agreed by HEFCE after the consultation of the sector"* [Environmental and Sustainability Officer]

Some of the universities have intermediate and/or annual targets to track the progress. For example, a post-1992 university has set a 2020 target. The university has set the annual target to measure the annual performance against the proposed targets. The Sustainability Manager mentioned that the annual targets are internal targets and are not advertised externally.

> *"We have the 2020 target, the target which we have to meet for 2020. In terms of annual target, we do set ourselves some sort of internal targets which we aim to meet annually. We do have annual performance targets which we have internally, but we don't advertise them externally"* [Sustainability Manager]

[10] Quotations from interviews are in tables.

In contrast, some universities do not have interim targets. For example, a pre-1992 Russell Group University does not have annual targets, but the university tracks its progress for reporting annually.

> *"No, we don't have annual targets. We have a target to 2020 but we do monitor on an annual basis. We monitor our carbon emissions, but we don't have targets"* [Head of Environment and Energy]

The Head of Environment and Energy called the reduction targets unrealistic and more of an aspiration, but universities report their targets and the subsequent progress both internally and externally. The Head of Environment and Energy did not really agree on the long term and ambitious targets as shown in the following extract.

> *"I don't think it's necessarily to be able to quantify completely how you intend to meet long term targets. I think the long term targets are more aspirational"* [Head of Environment and Energy]

Despite being aspirational, the targets could help universities to keep on track and focused in regard to carbon management, otherwise universities might not have anything to look ahead. The Sustainability Manager stated on the role of carbon reduction targets:

> *"It is important to have a target, a target which is a stretch target, but also realistic and achievable"* [Sustainability Manager]

The Head of Sustainable Development at the HE organisation revealed that individual institutions that have produced targets for 2020 make an aggregate of 38%. The HE sector's overall target is 43%, so there is a gap of 5% between the collective institutional targets and the agreed target of the sector. Carbon Credentials (2015) found that the sector has only reduced carbon emission by 9% since 2005/6 and a further reduction of 38% needs to be achieved for meeting the 2020 target. HEFCE has also published this in its sustainable development consultation and framework that sums of the individual targets do not meet the overall HE target (HEFCE, 2013a). This probably suggests further collective actions from universities. The targets are set against a set baseline. The baseline is considered as a benchmark against which the performance of carbon reduction targets is measured in universities. The majority of the interviewees did not specify the baseline. Only four interviewees mentioned their baseline year and three of which stated that 2005/06 is their baseline. The majority of the universities have 2005/06 as the baseline year, because data are available to calculate emissions for this year, as explored in Section 5.9 in Chapter 5. There is one university that is using 2004/05 baseline. According to the Carbon and Energy Manager, the reason for 2004/05 as the baseline was the most complete set of data at that time and this was before HEFCE set 2005/06 baseline.

6.7.1. Absolute and relative targets

This section discusses the types of targets, absolute and relative. The majority of the managers did not mention the types of targets and it is unclear whether universities have absolute or relative targets. However, HEFCE and the national targets are absolute targets. Only two interviewees differentiated between absolute and relative carbon reduction targets. The relative reductions seem to allow universities to continue to grow. In spite of being more efficient, carbon emissions still rise with

growth, but relative carbon emissions are reduced. The relative targets are measured against matrices of per Full Time Equivalent (FTE) student, per meter square floor area or per unit turnover. Currently, universities seem to be more focused on relative targets for performance measurement and reporting and they are starting to realise that they are not achieving real reductions with relative targets, whereas absolute targets are difficult to meet for a research intensive or growing university. The Chief Executive at the HE organisation argued that the debate on absolute and relative targets has received much attention. He was of the view that relative reductions allow universities to grow. Universities are being more efficient, but carbon is still rising and they think its fine, we are being more efficient per student but we have grown twice the size.

> *"The big debate in the sector at the minute is over actual reductions and relative reductions. Relative reductions allow universities to continue to grow and build. They are being a bit more efficient, but carbon is still rising and they think its fine, we are being a bit more efficient per student, but we have grown twice the size. We are going to see more firm actual reductions and some universities are basically buying carbon credits and save over the space of three months, they were now zero carbon and they were all happy about this. I can't see that being acceptable"* [Chief Executive]

The Director of Climate Change Policy criticised relative targets:

> *"The minute I see, per student or per square meter, those are all relative numbers and very distracting relative numbers"* [Director of Climate Policy]

6.8. Stakeholder engagement

Stakeholder engagement emerged as one of the key themes in CMPs as illustrated in Section 5.11. Universities are attempting to engage different stakeholders for carbon management. Ten interviewees mentioned that stakeholder engagement is an important part of carbon management and all of them are trying to achieve the results through engagement initiatives. Universities have a range of internal and external stakeholders, but it is mainly discussed from staff and student perspective. Among the university stakeholders, staff and student is the largest stakeholder group and has received more focus in CMPs. The content analysis indicates that CMPs do not discuss wider stakeholders for engagement. The Head of Sustainable Development discussed the role of internal and external stakeholders and suggested a collaborative approach.

> *"I think it relies on kind of combined action from a number of people including sector bodies like AUDE, estates' director group has done tremendous job on carbon reduction, like Universities UK and Guild HE and the NUS. I think it probably needs students as well to be vocal and clear that it is important to them"* [Head of Sustainable Development]

6.8.1. Staff and student engagement

Staff and student engagement is a key part of stakeholder engagement (see Section 5.11.1). The content analysis indicates that universities are trying to engage staff and students with appropriate engagement strategies. Ten universities (out of the eighteen) have clearly elaborated the role of staff and students and their engagement in carbon management. Loughborough University's CMP highlights an important role of staff and student engagement for carbon management:

> *"If the university is serious about meeting the challenge of achieving the targets set out within this plan and be seen as a leading low carbon campus within the Higher Education sector, every member of staff and the student body needs to engage in the carbon agenda"* [CMP Loughborough University, p. 3]

Ten out of the seventeen interviewees mentioned the issue of behaviour change for staff and students as an important barrier and indicated a lack of staff and student engagement. The majority of these interviewees were middle managers from estate and facilities management departments. An Environmental Manager of a post-1992 university presented this barrier by arguing that it is difficult to change behaviour for engagement:

> *"Behaviour change, people are just stuck in their ways they always done it, not willing to change, so it's really big one. That's the main one, so it could be behaviour change"* [Environmental Manager]

There seems to be a lack of staff and student engagement in many universities and therefore, five of the interviewees argued that university managers need to change the behaviour of stakeholders to enhance engagement. They are focused on staff and student engagement strategies to bring change. The Director of Sustainable Development at a post-1992 university argued that staff and student engagement is a key challenge. They use energy in buildings and therefore, it is crucial to make them understand the significance of carbon management and their responsibility and potential contribution in the process. Staff and student engagement can help making informed decisions towards carbon management.

> *"The biggest issue is the engagement of staff in terms of people in buildings who use energy in buildings and engagement of staff at senior level to get them to understand that carbon management is a crucial part of their duties, get staff and students thoroughly behind this, make sure staff and students understand why the university is doing it and if people understand then they will question things that are currently happening, question things they purchase and change how they use energy in the work place"* [Director of Sustainable Development]

The Chancellor of the pre-1992 university argued that student engagement is a critical determinant of the success CMPs. Universities have been involving students in carbon management activities through different ways. The extract below demonstrates the role of student engagement:

> *"The final issue regards the involvement of the student body. I'm sure you've had a chance to have a look at ways in which different universities have involved their students, and this is a critical determinant of whether or not carbon management plans are likely to work"* [Chancellor]

All of the stakeholders have their primary roles to fulfil, so it is hard for them to spare time and get involved in carbon management process. The issue of engagement could be due to a lack of knowledge and understanding on environmental issues and focus on their main duties (education or work). Furthermore, universities have a huge population of staff and students and it could be challenging to engage them all. An Environmental & Sustainability Officer mentioned the 'Green Impact' and 'Students Switch Off' projects as the key engagement tools, but many universities are implementing these projects as reflected in their CMPs.

> *"We do student switch off project in the halls we own and run and we are also doing the Green Impact project for staff. We also work with DSU (DMU Students Union) to try and raise awareness about environmental issues"* [Environmental and Sustainability Officer]

This quotation indicates that to engage staff and students, universities are carrying out campaigns and behavioural change activities. Students' Unions have also been active recently to reduce emissions, but there is not much involvement as universities would like to see across the staff and student population. CMPs also do not provide enough evidence for wider stakeholder engagement and how effective staff and student engagement has been. The Transport Coordinator at a post-1992 university argued that it is difficult to change behaviour, because people find easy ways to do things and many of the individuals have wrong perceptions of the environmental and carbon agenda. However, universities seem to acknowledge the importance of stakeholder engagement. Many of the schemes have already been implemented, but a lot of work still needs to be done. The Head of Environment and Energy at a pre-1992 university agreed with the Transport Coordinator's point of view and mentioned that staff and student engagement is difficult due to staff and students not paying energy bills. This suggests that there is a lack of self-interest among the stakeholders, staff and students.

> *"Well the experience is, staff engagement is very difficult; staff and student engagement is really difficult, because most of us think that we don't pay the electricity or who collects our waste, we don't care, so yes it's a part of awareness and engagement"* [Head of Environment and Energy]

The Head of Sustainable Development seemed to be aware of the current stakeholder engagement activities and argued that self-interest is an important part of engagement process and it seems to be lacking. As a result, employers such as universities can save cost and demonstrate value for graduates.

> *"It needs people to see what's in it for them as well, so not just doing it for ethical reasons, so people can see self-interest is part of it. I think there is money in it for them as well that is the case for universities particularly in research terms and probably curriculum as well, employers want it. I think it needs employers to make it clear that they value it for graduates"* [Head of Sustainable Development]

There is a lack of senior management leadership in many of the universities. In the extract below, the Head of Estates Management at a post-1992 university reported that there is buy-in at senior level, but there is a lack of engagement from staff and students.

> *"I think there is buy-in at senior executive level with the environmental sustainability agenda, but I think how you trickle down to the staff, academic and professional services staff, there is not as much involvement as you as we like to see, across the staff population and the student population"* [Head of Estates Management]

NUS was contacted through an email to take their perspective on the role of students, Student Unions (SUs) and the level of their engagement. The representative of the NUS highlighted that student representatives should be engaged in all agendas across HE, especially in the new post fees regime, when students are supposed to be at 'the heart of the system'. NUS believe that students want their institutions to embed sustainability in their operations, but there is an issue of greening the curriculum. It is believed that universities have bigger role in environmental education of future leaders than only managing their own environmental impact. However, in contrast, the DMU Green

Impact survey findings indicate that students consider environment as an important issue and have a lack of understanding and engagement. The contribution of SUs is mixed and has improved in recent years, but more needs to be done.

Researcher: How do you see the role and engagement of students for reducing carbon emissions in universities?
NUS: Student representatives should be engaged in all agendas across HE, especially post fees when students are supposed to be at 'the heart of the system'. Our NUS HEA survey has consistently shown that 80% of students (base 14,000 students) want their institutions to embed sustainability in their operations. BUT, the elephant in the room is greening the curriculum. We see the key role for universities as much more than managing their negative environmental impacts - ensuring students receive environmental education, regardless of discipline, is a duty of the sector and will go a long way to changing the attitudes and behaviours of cohort after cohort of future leaders. Course representatives can make good inroads on this agenda
Researcher: To what extent students' unions are contributing within universities currently?
NUS: It is mixed, but greatly improved in recent years through schemes like our Green Impact Students' Unions accreditation scheme, which helps SUs work with university environmental managers. Likewise our new Students Green Fund is all about collaboration. [Dated: 26/08/2013]

6.8.2. Strategic partnerships

Strategic partnership represents organisational level engagement with other organisations. Six out of the seventeen interviewees mentioned that their universities are in strategic partnership with other organisations to tackle environmental and carbon issues. The other partner organisations can include Local Authorities (LAs), NHS trusts, local community and businesses. These organisations can play an important role in strategic carbon management through a partnership approach with universities. There seems to be agreement on the mutual strategic advantages of partnerships, however, universities seem to be lagging behind in adopting strong strategic partnerships, as explored in Section 5.11.2. It was encouraged by these interviewees that universities should adopt a partnership approach to make a difference at a local and national level. However, majority of the interviewees did not discuss this theme. The Carbon and Energy Manager encouraged partnership to have bigger impact on carbon reduction, indicating that universities are adopting partnerships to some extent.

> *"We also need partnership working with others to make a huge impact, because there is so much reduction in carbon you can actually make, but you need to actually step outside the box, perhaps you could actually do"* [Carbon and Energy Manager]

As an example, the Sustainability Manager at a post-1992 university mentioned that his university is working in partnership with other local public sector organisations such as the Borough Council, the County Council, the police, the hospitals, universities and colleges to move forward in carbon management. These organisations could learn from each other and share experiences.

> *"We are trying to work with other local public sector organisations in the county. We are working with Borough Council, the County Council, the police, the hospitals and other colleges as well and trying to help each other to move forward really. So we are doing that. We also work with the universities in East Midland"* [Sustainability Manager]

The Director of Sustainable Development at a post-1992 university discussed the university's partnership approach of working with other local stakeholder organisations to reduce emissions not

only within the university, but also at the city scale. This suggests that universities may have bigger impact on carbon management.

> *"Only that university should be engaging with the communities in which they are located or in which they draw their students from. Universities can't be seen in isolation from their local geography, so they need to be working with other key stakeholders in their area to reduce emissions full stop, so DMU is working with University of Leicester, which is working with City Council, which is working with others to reduce emissions across the city of Leicester as well as DMU"* [Director of Sustainable Development]

The Head of Sustainable Development gave an idea of sharing resources such as tools and equipment, but currently, this does not seem to be fully established in the HE sector on voluntary basis. However, there exists an asset re-use and distribution system for universities and other public sector organisations. This is known as Waste Action Reuse Portal (Warp-it). University managers can search for surplus resources within their own or other partnering organisations (Warp-it, 2014). Xchange is another online system to sell and buy surplus equipment in the HE sector. This could save organisations waste, carbon emissions and money. Many public sector organisations have joined this system including universities. In contrast, the interviewee argued that there is a culture that universities want to have their own equipment and tools.

> *"I think more could happen on sharing of equipment, I think there is a culture that people have got to have their own kit and there is sort of link to prestige to have perhaps. I think yes these are amongst the challenges we got at the moment"* [Head of Sustainable Development]

6.9. Governance

Governance offers a mechanism for carbon management strategies to be implemented and aims to manage a diverse range of elements during the process. It came up as a theme in Chapter 5 and suggested sub-themes necessary to implement strategic carbon management. This section also discusses the overall performance of the sector from governance perspective based on interviewees' experiences. Unexpectedly, there were only three interviewees who specifically mentioned governance in regard to carbon management. The result is similar to the content analysis, where three universities' CMPs mentioned this theme. However, actions to govern strategic carbon management in universities seem to be key part of it. This theme discusses the sub-themes or issues related to governance. To highlight the governance issue, the Director of Estates at a post-1992 university quoted that *"the governance of the university is taking it seriously"*. This suggests the role of governance within a university. However, it seems that this is not the case for every university and it might need to be addressed strategically. On the basis of discussions with managers, it is anticipated that there is a lack of high level championing. The Deputy Procurement Manager at a post-1992 university argued that the procurement department has a small team to work on governance related issues. Currently, the progress does not seem to be satisfactory and more work needs to be done with faculties and departments for effective governance and management.

> *"We are a small team, we are not very well, we need to work much well with faculties and the departments"* [Deputy Procurement Manager]

The above statement provides evidence that carbon management is not integrated in the procurement process, mainly due to a lack of resources in the team. This aligns with the findings presented in Section 6.6.1. In regard to governance of carbon management, the interviewees were asked about the overall success of carbon management in universities. The responses suggest that, in general, the performance of universities seems to be satisfactory from governance and management perspectives and they are moving in the right direction. However, there is still a long way to go. The HE sector seems to be doing well in some of the areas with leading initiatives such as planning, targeting, scope 3 study, partnering and has achieved distinct status in terms of carbon management within the public sector. This suggests that there is good practice in the sector, but the performance of universities varies and some universities are doing well and some are struggling to perform well. The Head of Sustainable development at the HE organisation argued that *"sharing a good practice is really helpful, what works and what doesn't"*. On the other hand, the sector is facing challenges. The Head of Sustainable Development supported the argument:

> *"I think there are examples of outstanding practice which would compare with anything in the world to be honest"* [Head of Sustainable Development]

To support that, the Director of Sustainable Development at a post-1992 university argued that the overall performance of the university is good and it has done well over the last few years. However, it can be improved further, indicating a room for improvement.

> *"It's good, but it should be better. We can always do better. They have done well over the last few years, but it's not enough, so even doing well isn't enough"* [Director of Sustainable Development]

An Energy Manager at a pre-1992 university stated that the performance of his university is not as high as he would like to see. However, in general, the university seems to be doing fine, but there is a long way to go in terms of improvement.

> *"It's not high up there now as high as I like to see, but I think we are doing ok, we are not leader at the top, we are not at bottom doing nothing, we doing something, but we like to do more. So I think we are getting there but there is a long way to go"* [Energy Manager]

The Transport Coordinator was found to be satisfied with the university's performance and reported that carbon management is making slow progress.

> *"Things are getting better. It's slow process, but I'm happy with that. When things change overnight, they can change back equally quickly. If we make slow progress, things are more likely to stick"* [Transport Coordinator]

The Head of Environment and Energy at a research based pre-1992 University called carbon management challenging. However, good governance will improve carbon management.

> *"I think it's challenging, but I think we are moving in the right direction"* [Head of Environment and Energy]

The above extracts suggest that universities have governance and management procedures in place to reduce emissions, but the progress is slow. In regard to the overall sector performance, some

universities claimed that they are at the forefront of the HE sector. However, there is a contradiction between people's opinion on the overall carbon management performance of the sector. There are managers in the sector who believe that the performance is not good. For example, the Chief Executive and Director of Sustainable Development reported that:

> *"We had some successes, some areas have very good practice, but overall not good"* [Chief Executive]

> *"Universities are years behind than other organisations in looking at their carbon emissions, they been very slow to do it"* [Director of Sustainable Development]

The participants have mixed views and opinions on the overall success of carbon management. Contrary to the above statements, the Director of Climate Change Policy argued that linking capital funding with carbon performance and the tools such as Green Gown Awards have been good for the sector. Therefore, universities are best in the public sector, because other public sector organisations do not have such schemes. However, the link of capital funding with carbon management does not exist anymore, after the change in the funding regime in the sector.

> *"Universities are probably the best"* [Director of Climate Change Policy]

6.9.1. Communication

In the content analysis reported in Chapter 5, communication emerged as an important theme. The majority of the CMPs reviewed frame communication as a governance issue. This communication is related to all aspects of carbon management within a university, ranging from communicating energy and carbon emissions data to stakeholders, carbon management targets and strategies and the performance against the targets. Four interviewees mentioned communication as an important part of the carbon management process and declared that they have strategies to communicate carbon management issues to different stakeholders. This can be both internal and external communication. The interviewees were of the view that ideally targets and strategies need to be communicated to all of the stakeholders to achieve better results and then the performance should also be communicated through different channels to motivate them about the achievements. The Director of Sustainable Development at one of the HE organisations stressed the importance of communication.

> *"Communication to students, stakeholders and staff about what's going on and what's been achieved, so they feel involved in the process"* [Director of Sustainable Development]

Technical terms such as 'sustainability' and 'carbon management' seem to be quite complex for staff and students and there seems to be a lack of clarity among these stakeholders. Two out of total four interviewees made this point in the interviews and furthermore, need for effective communication was described by a Carbon and Energy Manager at a pre-1992 university to spread the message across. He noted that communication is the main issue and this could help embedding carbon management into the institution by developing its understanding.

> *"It is important for us in terms of communicating our strategy, so that it is embedded into the institution and I would say that perhaps communication is one the biggest issue. Still, people are not comfortable with the carbon management language, so it's important that they actually get used to that language and get used to the concept of why we actually doing it, what we have done in terms of carbon management and energy efficiency"* [Carbon and Energy Manager]

Three interviewees discussed that there is a lack of communication in universities. Overall, it can be noted that communication is not discussed widely by majority of the interviewees. It appears that universities are communicating on ad hoc basis. The Director of Sustainable Development at a post-1992 university argued that people seem to take a technical perspective on these issues and tend to focus on technical solutions. They seem to neglect human factors around carbon management. It was argued that university managers cannot put technologies in place without having communication with individuals because they are the one who use the technologies. This suggests that technology alone cannot solve the problems and it needs to be integrated with awareness raising and behaviour change among stakeholders.

> *"People are taking a technical solution to things that they are saying problem is technical we can solve the problem by putting some technology, but you can't put the technology by itself without talking to people, its people that use the technology if the people don't understand how the heating works, how the lighting works they can't use it properly"* [Director of Sustainable Development]

6.9.2. Integrated and comprehensive approach

The terms such as 'integrated' and 'comprehensive' were mentioned in regard to governance of carbon management. This refers to the 'whole-organisation approach' which also emerged in the content analysis. Ten interviewees suggested adopting an integrated and comprehensive approach to governance. However, the main challenge for integrated governance is to explore 'how to achieve this'. There is more lip service in the plans and strategies than robust actions for whole organisation approach. The argument was presented that universities demand consideration of all sources of emissions with the engagement of all the relevant stakeholders to make a bigger impact on carbon management at whole-organisation level. A Research Fellow, who is interested in carbon accounting and management, defined an integrated and comprehensive approach as a benchmark for universities. According to the Research Fellow, integrated approach to carbon management involves emissions from all of the sources, both direct and indirect.

> *"Integrated carbon management means to take into account all the emission sources because most of the time energy is the main contributor, that's why all the people just concentrate on those emissions and also is the one that you can directly influence most of the times. It is easy to influence but integrated means you also have to take into account all those emissions which go beyond your control"* [Research Fellow]

The above quotation suggests that for most of the time universities concentrate on energy related emissions due to their direct influence, but neglect other emissions sources. The quotation from an interview with the Head of Sustainable Development demonstrates the same argument of embedded approach to carbon management. He was of the view that low carbon strategies need to be

incorporated in the thinking and approach of individuals and departments. If all of the stakeholders understand and believe in carbon management, it could help in conscious decision-making around carbon management and improve it.

> *"I think it needs to be embedded in the thinking and approach of the whole university"* [Head of Sustainable Development]

In order to respond to integrated and comprehensive approach, an Environmental and Sustainability Officer at a post-1992 university argued that the university has adopted this approach by integrating scope 1, 2 and 3 emissions in its strategy rather than focusing on direct energy consumption. The other universities can learn from this.

> *"DMU has taken a quite comprehensive approach to carbon management, rather than focussing on gas and electricity. We decided to look at wider range of carbon emissions sources to record and report, scope 1 (gas and electricity, DMU's own vehicle), scope 2 and also scope 3 emissions (business travel, staff and student commuting, procurement, also report emissions from international student travel, also UK based students)"* [Environmental and Sustainability Officer]

6.9.3. Environmental benchmarking

Environmental benchmarking is an increasingly important tool for comparing environmental and sustainability performance, as suggested by Chapter 2 and 5. The benchmarking schemes have received attention in the HE sector exploring how universities are governing carbon management. The Chancellor complemented this by saying that *"tonnes of stuff that you can follow up on here through People and Planet and other organisations".* The content analysis found that universities have adopted various benchmarking schemes and tools such as People & Planet's UL, EcoCampus, ISO 14001, Green Gown Awards, BREEAM and the Carbon Trust Standard. These tools directly or indirectly impact carbon management. However, all of the benchmarking schemes mentioned in CMPs are optional. This might have implications for effective implementation of carbon management in universities. Universities are planning to participate in these benchmarking schemes and however, many of the universities are already part of the schemes. Eight out of the seventeen interviewees mentioned benchmarking with other institutions to monitor the progress and get the sector wide recognition. Benchmarking could provide a competitive environment within the HE sector. Four interviewees mentioned the Green Gown Awards and the People & Planet's University League (UL) while discussing the theme of environmental benchmarking. The Green Gown Awards recognise the exceptional sustainability initiatives undertaken by universities. There are fourteen categories at present and one of them is 'carbon reduction'. The Director of Climate Change Policy at a post-1992 university quoted that *"nobody else has sort of Green Gown Awards",* suggesting that the HE sector is in a distinguished position and other sectors do not have this kind of prestigious awards.

The UL was discussed by the interviewees to benchmark universities against their peers in the sector. It has categories of 'carbon management' and 'carbon reduction'. These schemes are already illustrated in Section 2.2.6. High ranking UK universities, for example Russell Group universities, are

at the bottom of the UL table (People and Planet, 2014c), may be because of their high energy intensive research and per head carbon emissions than a teaching based university (for example, post-1992 universities). The Head of Estates Management at a post-1992 university mentioned the university's participation in the most common schemes.

> *"There has been benchmarking criteria, like Green Gown Awards, the Green League, the effectiveness of Student Switch Off"* [Head of Estates Management]

In contrast, the Head of Environment and Energy at a research based pre-1992 university criticised the UL ranking and its methodology. This group of universities think that their universities are not compared fairly on a like-to-like basis and People & Planet should re-consider its methodology in the future. However, the methodology has been under revision in the past as a result of discussions with stakeholders in the Green League Oversight Group (GLOG). The Head of Environment and Energy criticised the use of relative matrix in the UL.

> *"I think the challenge in those league tables is the matrix used and if you take something like Green League as an example, one of the matrixes is carbon emissions per head, per staff and student numbers. Now, I see why they use that because it's something there is data available and they can put into the Green League. I think the challenge of the Green League is, they have limited resources and therefore the matrix are based on what they can freely access rather than necessarily what should be the matrix of representative green university. Now something like carbon emissions per head, a research intensive university always ends up higher emissions per head than a teaching based university by its nature"* [Head of Environment and Energy]

The above quotation indicates that research intensive universities tend to have more carbon emissions per head and a lower place in the league table. The other universities with less research and teaching focus have less per head carbon emissions and are at the top position of the ranking. This is because People & Planet have access to relative data only. All of the participating universities are treated in the same way, which may raise questions on fairness of the UL. However, benchmarking schemes such as the UL and the Green Gown Awards contribute to carbon management. Despite the drawbacks, these tools seem to have their advantages and distinguish the position of the sector for the success journey. Three interviewees mentioned BREEAM standard for their buildings and there was one individual who mentioned Leadership in Energy and Environmental Design (LEED). It appears that universities are moving towards BREEM 'Excellent' and 'Very Good' standards in new build and retrofit projects. The Head of Estates Management at a post-1992 university presented his ambition on BREEAM.

> *"We have got a headline objective of reaching BREEAM 'Very Good' standard for all of our new buildings which has various environmental criteria that we fulfil in delivering the various building projects that we undergo"* [Head of Estates Management]

A Carbon and Energy Manager of a pre-1992 university stated that his university aims for achieving BREEAM 'Excellent' in new build and major refurbishment, indicating that environmental assessment methods are getting established.

> *"We have gone for 'Excellent' rating for our design for new build, anything over £1m or if there is any major refurbishment, anything over £1m"* [Carbon and Energy Manager]

Reputation and market position

Reputation and market position in the HE sector is a driver for carbon management. Eight interviewees listed reputation as one of their drivers for carbon management. It is an important factor especially for the smaller developing universities competing with the already established universities in the sector. The majority of them are post-1992 universities in the UK. High ranking and research intensive universities do not seem to consider reputation as a major driver due to their established status. However, one of them had contradictory views on reputation being a driver. According to the majority of the interviewees, the market position and reputation will help attracting students in the future. However, this may not drive pre-1992 Russell Group universities to implement carbon management.

> *"Reputation as I say, reputation both locally, within the local area because we want to be seen as a leader within our local area, but also obviously reputation nationally as well among other higher education institutions"* [Environmental Manager]

In contrast, the Head of Environment and Energy at a Russell Group University argued that reputation is not a driver for them because students do not choose the university because of its environmental performance. Students choose the university based on its academic credentials and ranking in league tables suggesting that for the established universities, such as Russell group, reputation is not that important. Despite this, they do not completely ignore carbon management.

> *"No, I don't think students choose their university on environmental factors. I think some will, some very small numbers of committed will, but even in those cases, I think it might be a deciding factor between two or three. I don't think it's their top choice. You know students choose to come to 'X' because of its reputation, standard of it and its academic activities, the fact it's X. Having said that I don't think any university would want to have negative press around carbon emissions but I don't think it's a key driving factor". (Here X denotes that university)* [Head of Environment and Energy]

6.9.4. Space management

Space management emerged as a governance issue in Chapter 5. Five interviewees linked strategic carbon management with space management. This theme is not well established in universities' CMPs as found in the content analysis. This suggests that universities have not understood the implications of it for implementing carbon management. However, all of these five interviewees described the importance of space management and identified huge inefficiency of space in universities. In contrast, HEFCE (2011) reported that space is being used more efficiently in both public and private sector organisations. Space per person is reduced from $9.6m^2$ to $8.8m^2$ in the HE sector, but office space per academic has increased from $13m^2$ to $13.8m^2$. Additionally, it was argued that space management is more difficult for multi-campus universities, because each campus has different issues to deal with. However, it appears that space management has the potential to reduce emissions. The Head of Sustainable Development complemented this argument and asked for space efficiency.

> *"Space of course, efficient use of space and I think the sector is definitely got room for improvement in high efficiency, using space and estate pretty much equals carbon"* [Head of Sustainable Development]

Space management is about deciding how a university wants to be seen in the future in terms of its space. It may involve strategic decisions of new build, retrofit and demolishing buildings. The Chief Executive argued that there is huge inefficiency in space within the HE sector. It was argued that buildings are empty throughout the year and they consume energy and has cost associated with them.

> *"The buildings are used throughout the year as supposed to being lying empty for half of it which is what currently it is, it's huge inefficiency in space"* [Chief Executive]

An Environmental Manager at a post-1992 university discussed some of the space management strategies including the reduction in floor area and effective use of space. The university conducted utilisation surveys to capture wastage of space and some of the buildings are closed which are not in use. This could ensure less but efficient space.

> *"What we have also done is reduce the floor space of our estates and we use space more efficiently, utilisation surveys, because we have a huge waste of space, that's really important the university use space better. So we have closed some of our older buildings and not replace them and so we got less space which is more efficient and we will be doing that again on our other campuses in the next couple of years"* [Environmental Manager]

An Energy Manager argued that the university considers non-technical measures on how space works, how different departments and faculties work together and how students interact with each other in the designated space. It was argued that faculties and departments should work together to produce smart spaces to meet the ambitious carbon reduction targets. The Director of Estates at a post-1992 university reported that the university has reduced its size by 30% in the last few years, which is a huge change in terms of space. The Director of Estates believed in small and efficient size of the estate rather than a large and inefficient estate. This is in line with Abd-Razak (2012) who argued that planned and compact university campus offers minimal problems as compared to a wide and dispersed campus. Compact campus is more practical in terms of sustainability. Despite this, two participant universities have successfully reduced the size of their estate, suggesting that lessons may be learnt across the sector.

> *"We have been successful in reducing our estates size and we have now small space and it is easy to manage"* [Director of Estate]

Complex building stock

The issue of complex and historical listed building stock emerged in the interviews and CMPs. Listed buildings mark and celebrate their special historic and architectural interest, and also bring it under the consideration of the planning procedures for the protection. All buildings built before 1700 and between 1700 and 1840 holding their original condition are listed. Listed buildings are categorised into Grade I, Grade II* and Grade II (Historic England, 2017). Many of the universities have old, historical and diverse nature of building stock, which is complex for estates managers to deal with in regard to improving carbon management. Therefore, these universities are struggling to work with this

type of buildings. In addition, some of the universities have listed buildings and estates managers can only do limited work on those buildings. This may be due to historical nature and existing façade of the buildings. *"Some institutions will have major parts of their estate in conservation areas and may have an extensive range of listed buildings, which will significantly influence their estate development strategy plans. Others may have relatively little property in this category"* (AUDE, 2013, p. 13). Therefore, this is a challenge universities are facing in order to improve carbon management performance of their building stock. The challenge of old and historical listed buildings was mentioned in only two universities' CMPs. This is considered as a barrier for effective carbon management and universities are carrying out actions to tackle the historical nature of their estate. Four university managers have been facing this problem in their universities. Older universities especially pre-1992 universities seem to be facing more of this problem. The Head of Environment and Energy at a pre-1992 university (Russell Group) stated that complexity of buildings is critical and does not support carbon management.

> *"The main challenges are around the estate, the diverse nature of it, and the historical listed buildings"* [Head of Environment and Energy]

An Environmental Manager argued that there is always room to improve a building to a certain extent. There comes a point where you cannot do much more to the fabric of an existing building to make it more energy and carbon efficient. There is always a limit where it can cost more than constructing a new building. A Sustainability Manager supported the above argument by stating that there is always room to improve a building to a certain extent.

> *"I think there is always a space to improve one thing I mean one of the issues is, if you got all the buildings, there is only certain amount of things which you can do with all the buildings. There comes a point where you cannot actually do much more to the fabric of the buildings to make the efficiency much better, but unless you spend a lots and lots of money, so there is a sort of point where you have to actually say ok you cannot do more to the building fabric because it's going to cost us a lot more money, so you are restricted by the buildings themselves"* [Sustainability Manager]

The Director of Sustainable Development raised an important issue and stated that building users find energy use in buildings as a complicated issue due to their controls. They do not feel control over heating, ventilation or lighting. This suggests that there may be a lack of understanding and communication.

> *"Buildings are too complicated, the controls are too complicated, people do not feel they have control of their heating, their ventilation, their lighting sometimes and because of that they cannot do anything about it, if you allow and give people level of control, if they understand how things work and they can put things right and they quite often reduce emissions and this building is a good example, this building is very poorly controlled"* [Director of Sustainable Development]

The annual cost of energy and carbon emissions of these buildings tends to be relatively higher than others. The University of Birmingham aims to integrate carbon management in its activities and reflects on the key issues for carbon management such as energy intensive research base and the existence of historic buildings in its CMP.

> *"This document sets out practical measures that will deliver this goal and articulates our determination to fully integrate carbon management in all our activities. These actions reflect an energy intensive research base, the historic nature of our Estate and a desire for our research on energy efficiency to be adopted in daily business"* [University of Birmingham Carbon Management Implementation Plan, p.3]

Energy and carbon intensive research

The government is driving universities to be at the leading edge of research and some parts of research can be energy and carbon intensive. Research intensive universities, which are predominantly Russell group universities, are mainly facing this barrier. Three of the interviewees discussed energy intensive research as one of the barriers to carbon management.

> *"I think probably sort of research as well, the government is calling on universities to be at the leading edge of research and some parts of research can be really carbon intensive and I think it is a bit of challenge"* [Head of Sustainable Development]

In the content analysis, three universities mentioned the challenge of energy and carbon intensive research activities. All of the three universities belong to the pre-1992 Russell Group. This suggests that this group of universities can be considered more energy intensive as compared to other groups. The University of Cambridge mentions the research growth in its CMP and proposes that future carbon reduction targets should take into account this research growth.

> *"It should be noted that in recent years the University of Cambridge has been particularly successful in the fields of research and teaching, and there has been a substantial growth in activity across the University. Research income, for example, has grown as an average rate in real terms of 8% p.a. in real terms. Energy consumption has grown steadily as a consequence of this growth, which has also led to a growth in the estate"* [University of Cambridge Carbon Management Plan, p.6]

The above quotation suggests that the university has been successful in growing teaching and research activities. This has led to growth in the estate, energy consumption and emissions indicating a direct link of energy and carbon intensive research and increase in emissions. The Head of Environment and Energy at a pre-1992 university supported this argument by reporting that universities conducting research have particular problems, which can lead to higher emissions in laboratories due to the equipment. The CMP of the University of Cambridge states that the management of emissions associated with research activities should be part of future plans, but this is not considered. However, the university should not use it as an excuse for not implementing carbon management.

> *"It is clear that, given the major importance of growing research-related emissions, their control and management should become a distinctive part of the future plan of the university. It should not be an excuse for the university"* [University of Cambridge Carbon Management Plan, p.10]

The activities of universities may differ and the largest contribution to carbon emissions comes from departments that are engaged in scientific research. The data analysis of English universities demonstrates that the Russell Group represents 15 of the highest 18 carbon intensive universities in England. Many of the universities that were not part of the Russell Group (at the time of writing) are likely to have a high volume of science and technology related teaching and research activities

(HEFCE, 2010). Figure 27 shows the comparison of carbon emissions (tonnes per year) produced by different English universities and the Russell Group universities are highlighted among highest in emissions generation. This is the reason that Russell group universities are at the bottom of the UL.

> *"The university plan includes for an expansive capital program over the next 5 years. Even though the university ensures that its developments are BREEAM excellent as a minimum development within a research led university will inevitably result in an underlying growth in energy use from these new buildings. The estimated new build increase to 2015 is circa 30000m^2 and a corresponding estimated annual increase in CO_2 of circa 3000 tonnes"* [The University of Nottingham Carbon Management Plan, p.8]

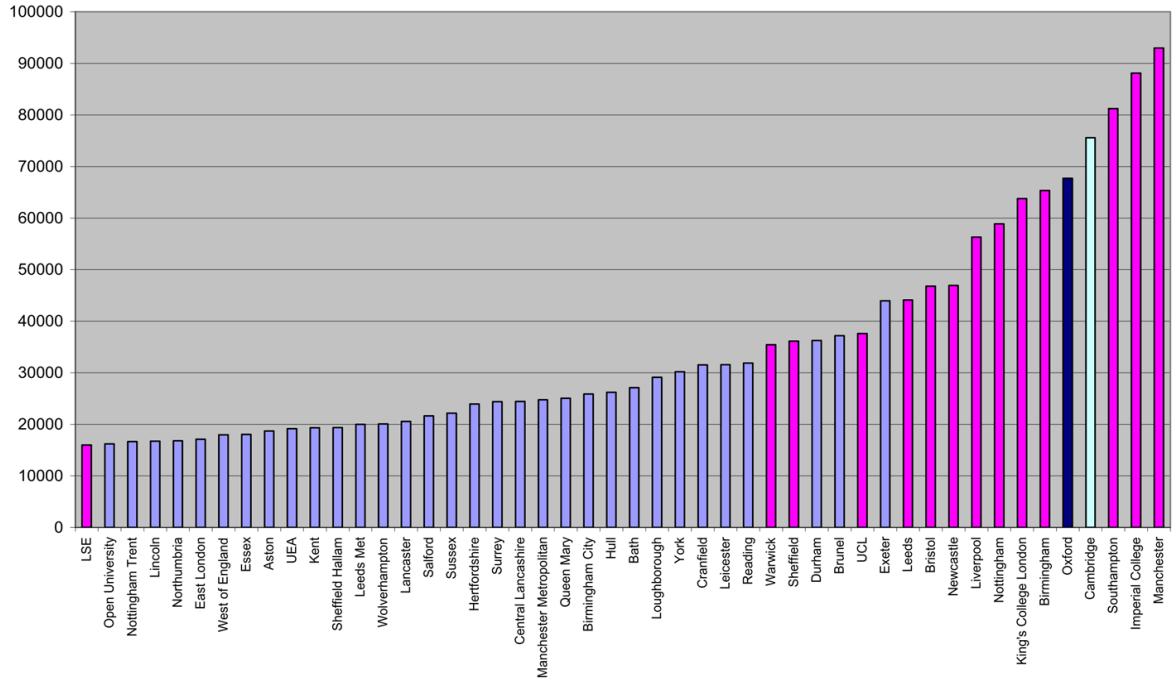

Figure 27: Comparison of CO_2 emissions from highest 48 English universities (University of Cambridge Carbon Management Plan, 2010)

6.10. Responsibility

The interviewees were asked about the overall responsibility for carbon management in their universities. Responsibility for carbon management is a key factor (see Section 5.13) and thirteen of the interviews discussed the role of 'responsibility' in implementing carbon management. The content analysis also suggested that the majority of the universities consider responsibility a key carbon management issue, but it appears to be varied and different individuals with different job roles are responsible for carbon management. The analysis divided the responsibility into middle managers, working/task/steering groups and everyone within a university. The interview study found that the responsibility can be divided into three categories, everyone, estates department and VC or senior management team. This indicates that responsibilities for carbon management seem to be dispersed in the UK universities and may also indicate lack of clarity. The majority of the interviewees (ten out of the seventeen) stated that the overall responsibility for carbon management is with everyone within the university, but estates department is only responsible for implementing carbon management

strategies. This suggests that everyone needs to take ownership and responsibility for it. In contrast, the majority of the CMPs (ten) indicate that the overall responsibility lies with a working/steering/task group in universities and four of the CMPs state that 'everyone' is responsible for contributing to the process. The extracts of the interview with an Environmental and Sustainability Officer at a post-1992 university demonstrates that everybody has a responsibility.

> *"I think everybody has got a responsibility, staff and students have got responsibility to play their part. I know lot of the time it is seen as estates role, but I think it's much wider than that. You have to look at lot of other things within a university to think about carbon related emissions, I don't think it's just estate, senior management also got a big responsibility in terms of the decisions they make"* [Environmental and Sustainability Officer]

The role of staff and students is emphasised in the above extract. The middle managers in estates want them to take the responsibility. For carbon management process to be successful, wider responsibility appears to be essential. It was argued that senior management has a responsibility in terms of strategic decisions they make within the university. These decisions could have a significant impact on the strategic approach to carbon management. This argument was reinforced when the Head of Environment and Energy at a pre-1992 university stated that ultimately, the strategic responsibility lies with senior management team or VC. However, there were two interviewees who supported the argument of senior management having the overall strategic responsibility. The sub-theme of 'strategic responsibility' was not discussed separately as opposed to Section 5.8.2 in Chapter 5. The strategic role of senior management is mentioned in the extract below:

> *"Well I think it lies with everyone. If you have to name an individual it lies with the Pro Vice-Chancellor for institutional affairs"* [Head of Environment and Energy]

Many of the interviewees clarified that carbon management is not only estates' responsibility. Senior management, academic and professional services staff and students also have a responsibility towards it. Middle managers within estates seem to be working as individuals which might not be very helpful for carbon management. It appears that they do not have much influence on other stakeholders to bring change. An Energy Manager at a pre-1992 university argued on the support of VC for influencing strategic decisions. This was inferred from the following extract.

> *"Me as an individual can't influence enough people to make a difference. It's not good to me to go to space committee to tell the two professors are going to have to share a space, that's going to come from the vice-chancellor. So there is a whole level of people working on it. It's integrated across the university now"* [Energy Manager]

The role of academic staff is overlooked and the majority of the CMPs do not highlight their role. The Chancellor of the pre-1992 university was contacted through an email to take his perspective and he criticised by stating that academics think that carbon management is not their responsibility and it is someone else' responsibility, preferably a specialist within estates department. This seems to be wrong perception and aligns with what estates managers have been arguing above.

> *"Academics are notorious at thinking that this is somebody else's responsibility, and therefore something they can just leave to somebody else. Preferably a specialist"* [Chancellor]

From a hierarchical point of view, 'operational responsibility' would rest on energy manager, who normally reports to the director of estates, who typically might report to a member of the senior management team. The estates managers are middle managers; however, they do not have control over strategic decisions. Their role and responsibility is operational with no participation in strategic decision-making and even Heads of Environment or Sustainability do not sit in the senior management team. The Associate PVC for External Engagement and Stakeholder Development at a post -1992 university stated at the Green Gown Awards ceremony that *"businesses have head of sustainability who sometimes sit on board. This is a huge shift, but it is not in universities".* The Carbon and Energy Manager at a pre-1992 university supported this argument and stated that his responsibility is to deliver the carbon management strategy and help meet the targets by taking a lead.

> *"My responsibility is to help the university deliver the carbon management strategy and my responsibility is to actually manage the carbon impacts of the university and help towards achieving the targets the university has actually set. But the target is not my target; its institution's target. I am actually helping to strive towards that and the team as well"* [Carbon and Energy Manager]

Table 51 presents the dialogue between the Researcher and an Environmental Manager at a post-1992 university on the responsibility. Similar to other estates managers, he argued that everybody should be responsible for it, but officially, a middle manager in estates is responsible. It can be noted from the extract that small number of staff takes responsibility for it. As a result of this, it can be implied that not everyone within the estates department takes responsibility for reducing university's carbon emissions. In contrast, the Head of Sustainable Development argued that carbon reduction is included in a lot of people's job descriptions and incorporating it in job descriptions could influence change. However, there was not much evidence gathered on this matter.

Researcher: Where do you think the responsibility lies for reducing carbon emissions within the university? **Environmental Manager:** Everybody. But I think, in general, though there is a small number of staff that takes responsibility for it and they are generally in the estates department. **Researcher:** So, officially estates department is responsible for it? **Environmental Manager:** Yes, but ideally we want everybody to be responsible for it.

Table 51: Interview extract demonstrating responsibility for carbon management

Environmental teams have different structures in universities. The core responsibility varies in universities, ranging from energy manager, carbon manager to environmental and sustainability manager. It depends on how the organisational and estates' management structure works in the university. This suggests that most of the participants were responsible for carbon management, but their job titles varied significantly. In the interviews, strategic and operational responsibilities were not clearly distinguished, which could result in a lack of clarity over responsibility. A Carbon and Energy Manager at a pre-1992 university argued that variations in responsibility exist due to institutional settings.

> *"It depends on the institution how the institution looks at the responsibility and looks at the role and that's how they actually title the role and also create the role"* [Carbon and Energy Manager]

6.10.1. Ownership

Ownership means that everyone within a university takes official or unofficial responsibility and contributes towards carbon management. According to the interviewees, ownership is an important element for implementing carbon management. Seven interviewees mentioned building ownership in universities. The ownership could be either at an individual level or a departmental level. As far as individual ownership is concerned, the Head of Sustainable Development argued that carbon management needs ownership, which will make it a norm in the university.

> *"It needs day to day involvement by estates staff, by students and actually to become part of everybody's daily life"* [Head of Sustainable Development]

Environmental teams mainly own carbon management and it seems to be relatively established at the estates level, but the ownership at the top and bottom of the universities seems to be unclear. This suggests that carbon management is not embedded in whole organisation.

> *"I guess the biggest thing would be to get the community inside because it's not been it's not embedded into this system yet and that needs to happen before the real impact happens"* [Carbon and Energy Manager]

The Director of Estates at a post-1992 university complemented this argument and stated that "*it needs people's understanding and ownership"* and furthermore, it was quoted that *"we have champions in the departments and the faculties".* This might not be the case in majority of the universities. However, it appears that environmental managers are working well on this agenda, as it was appreciated in the EAUC conference held in April, 2013 in Nottingham. Middle managers represent universities in this kind of conferences. There is very little participation from senior managers. As a result, some universities have used incentives as a key strategy to build ownership. Some universities have adopted innovative approaches for energy and carbon management and it is not common among majority of the universities. Three universities are using electricity budgeting schemes to enhance departmental engagement and ownership. The departments are given financial incentives based on their energy performance. Two of them are post-1992 universities and one is an energy intensive pre-1992 university. One post-1992 university has developed the scheme to make schools or departments more energy efficient. Electricity savings made by the departments are rewarded financially based on the net energy savings and participating buildings are also placed in an internal league table for ranking. The pre-1992 university has developed electricity incentivisation schemes for individual departments. The scheme allocates a baseline to departments for their annual electricity usage and the cost based on their historical electricity usage. The departments are financially incentivised or penalised against this baseline. The third university produces an Energy League to compare the departments. However, energy cost is paid centrally and departments might not have a direct financial incentive to manage energy and carbon emissions.

One of the universities has a 'Carbon Management Board' to drive the CMP forward. The board has a wider representation including the Pro Vice-Chancellor for institutional affairs, the Deputy Director of Finance, the Director of Estates, representatives from schools and the computing services. This cross departmental representation aims to encourage stakeholder engagement and ownership. Environmental and Sustainability Officer gave emphasis on the sense of ownership from all of the stakeholders, which is same as reported in the above theme.

> *"The other thing to make sure that people understand that their activities effect our carbon emissions, sort of building ownership, so all of faculties and departments understand that it's not just down to estates to reduce carbon, not just scope 1 and 2, scope 3 as well, but it's everybody's role to do that, everybody has a role, all staff, all faculties, all the directorates plus all the students have a role as well. Everyone should have an ownership in the process"* [Environmental and Sustainability Officer]

As relevant members of universities' environment teams were contacted through emails for conducting the interviews, but some of the individuals directed the researcher to the person who is officially responsible for carbon management or have direct contribution in it. This suggests that there is a lack of ownership in some universities, as every member of staff in environment team does not own it. Figure 28 presents the key themes and sub-themes emerged as a result of the analysis of interviews. Selected themes will be tested in the DMU case study in Chapter 7.

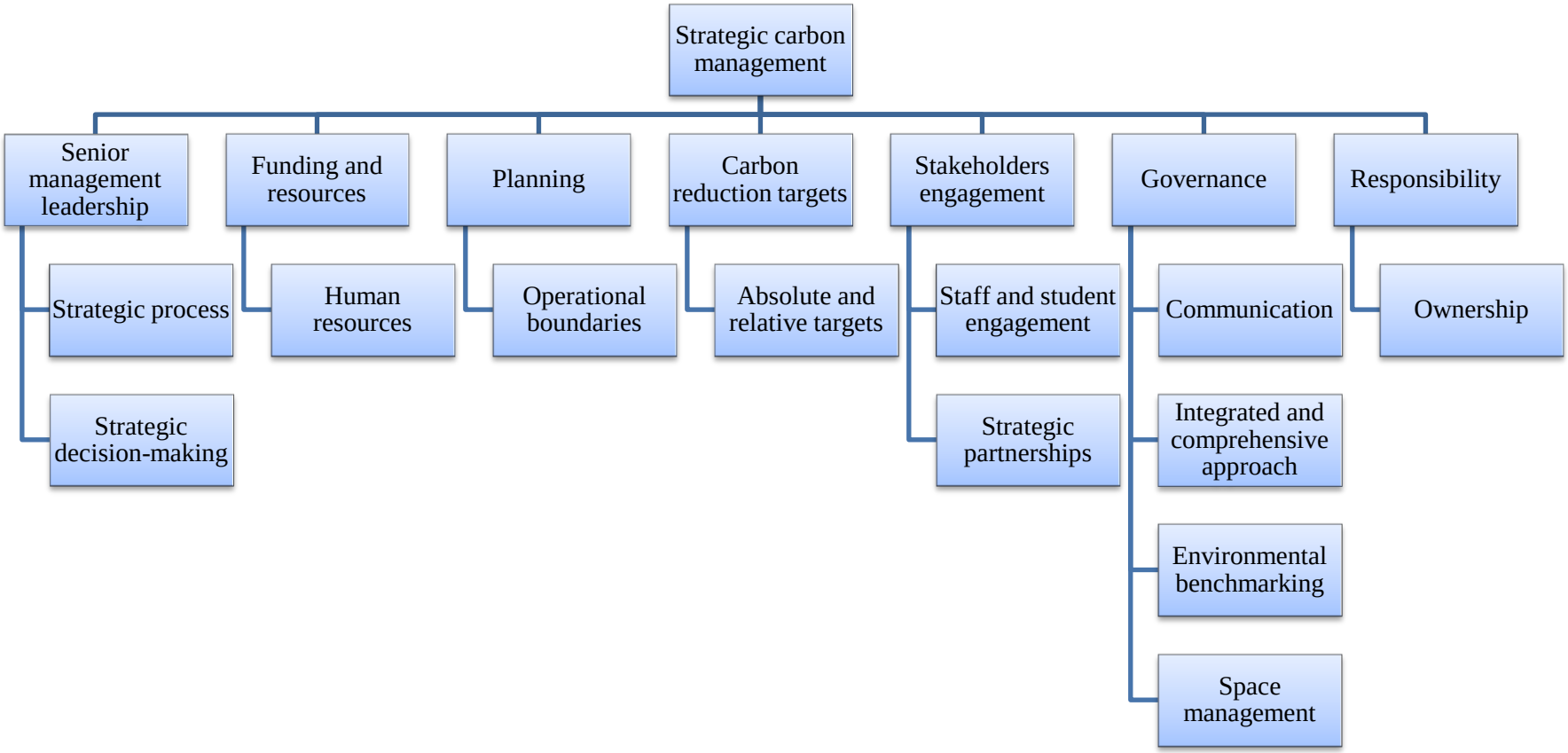

Figure 28: Thematic framework for strategic carbon management

6.11. Drivers and barriers to strategic carbon management

This section summarises the drivers and barriers to strategic carbon management informed by the interviews and content analysis. Strategic carbon management is driven by a range of drivers divided into policy drivers (external) and soft drivers (internal). Policy drivers are the regulatory drivers and the other drivers affecting individual institutions are categorised as soft or organisational drivers. The policy drivers are identified and reviewed in Chapter 2. The policy drivers are fixed for all universities and are imposed by the government as a legally binding. The interviewees were asked a question to explore 'what are the key drivers for carbon management for their universities'. To avoid the repetition in Chapter 5 and 6, this section presents the key drivers as a result of the analysis of the interviews and CMPs. All of the CMPs highlight the wider context of carbon management in terms of its drivers. The majority of the universities (fifteen out of the eighteen) have listed the drivers in their CMPs. In contrast, some universities have not mentioned the drivers, which are actually the drivers, not only for that particular university, but also for other universities. This may suggest a lack of understanding of managers or lack of priority. The soft drivers explored through the interviews are presented in this section. All of the drivers for strategic carbon management were listed and ranked in the survey. Figure 29 presents the main drivers. The drivers are synthesis of the soft drivers discussed in this chapter and the policy drivers discussed in Chapter 2.

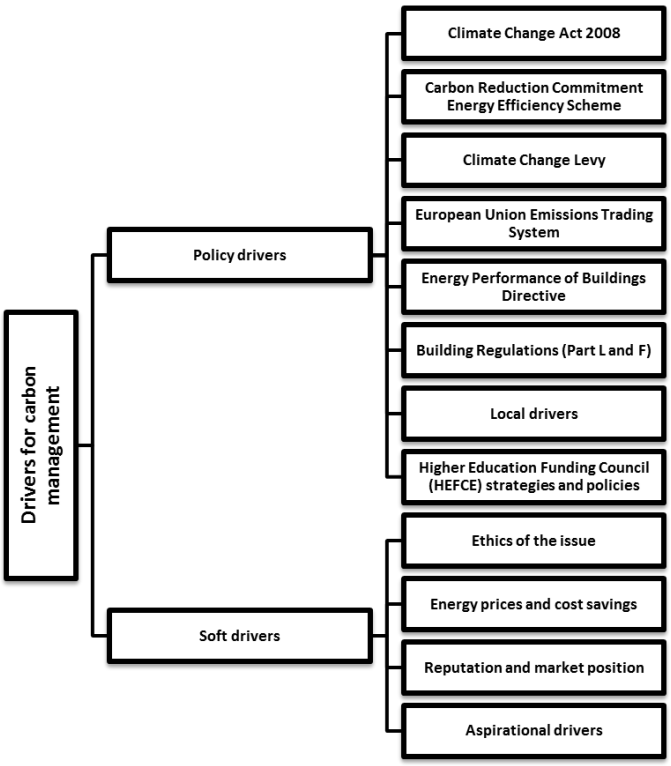

Figure 29: A framework for strategic carbon management drivers

As far as barriers are concerned, CMPs do not specifically identify barriers. However, some CMPs have discussed the key issues which can impact the effective implementation of carbon management. The content analysis identified that estate development and business growth, historical and complex

building stock and energy and carbon intensive research are some of the key issues universities are facing. These are the barriers to SCM and are discussed in Section 6.4.2 and 6.9.4 respectively. As the content analysis did not gather a comprehensive list of barriers, interviewees were asked about the barriers, based on their experience. The study found that a lack of funding & resources, behaviour change, lack of time, lack of ethical considerations, lack of senior management leadership, complex building stock, estate development & business growth and conflicts & core business priorities are the most common barriers universities are facing. University managers discussed barriers according to their own situations, whereas other interviewees' from the sector organisations gave their personal views on what they perceive as barriers to carbon management in the sector. The interviewees have varying opinions on barriers and different universities are facing different barriers, but majority of them are in common. The barriers, their frequencies and discussion sections are presented in Table 52.

Nos.	Barriers	Frequencies	Discussion
1	Lack of funding	13	6.5
2	Behaviour change/lack of staff and student engagement	9	6.8.1
3	Lack of resources	7	6.5.1
4	Lack of time	4	6.5.1
5	Lack of ethical considerations	4	6.3
6	Lack of senior management leadership	6	6.4
7	Complex buildings stock	4	6.9.4
8	Estate development and business growth	3	6.4.2
9	Conflicts and core business priorities	2	6.4.2
10	Energy and carbon intensive research	3	6.9.4

Table 52: Barriers to strategic carbon management

6.11.1. Ranking of drivers for strategic carbon management

The drivers for strategic carbon management were explored in the first phase research, as presented in Section 6.11. A comprehensive list of the drivers was developed and modified to test on a large sample of universities in the UK. There were 14 drivers in the proposed list and the respondents were requested to rank according to the level of importance on a Five Likert scale. The ranking scale was from 1 to 5, where 1 shows 'Not important and 5 'Very important'. Table 53 has ranked all the drivers. The majority of the respondents completed this question. The statistical results show that the most important driver for strategic carbon management is 'Financial savings'. This has a mean value of '4.27' and is the highest mean value than any other driver. This suggests that universities are concerned of their financial savings and this could motivate them to implement strategic carbon management strategies.

"The financial drivers are the priority for most organisations" [Energy Reduction Manager]

An Environmental and Cultural Change Manager at a pre-92 university complemented the above argument and went on saying that cost is a main driver which makes universities focus on scope 1 and

scope 2 energy related emissions. In addition, she stated that reputation in the UL ranking table is a driving factor.

> *"Cost is major driver; hence focus on scopes 1 and 2. Green League also important - has raised profile with senior management"* [Environmental and Cultural Change Manager]

The second most important driver for universities is Government 'Laws and regulations' related to carbon and energy policy and has a mean value of '4.22'. There is a range of laws, regulations and policy tools to implement strategic carbon management in the UK. The Sustainability Manager at a post-92 university stated:

> *"I don't think universities are necessarily used to be strategic, so having a 'strategic' plan for anything is not always commonplace. It's not necessarily what they need either. Strong regulation and compliance would sway it"* [Sustainability Manager]

Public sector including the HE sector has to comply with those policy measures. An Assistant Director (Engineering and Maintenance) at a Russell Group University quoted that "the CRC Energy Efficiency Scheme is effectively a carbon tax which takes away money that could otherwise be invested in saving energy". An email contact was made with this respondent for further exploration and was asked how it can be assured that universities will invest in energy saving measures, if they do not have to comply with carbon taxes such as CRC. The detailed response is presented in the text box below, which elaborates some of the drivers for strategic carbon management. 'Y' denotes the Russell Group University.

> I would contest the assertion that universities don't have to pay carbon tax. At Y, we have to comply with the Carbon Reduction Commitment (and before that EU ETS), climate change levy and we pay VAT on our fuel. So reducing our energy consumption, with the resultant carbon emissions, will reduce our spend on fuel and the consequential taxes. Notwithstanding taxation, there are still incentives to invest in energy saving measures:
> 1. Energy is expensive so reducing its consumption frees up money for other things.
> 2. Energy reduction projects will usually have a payback. At Y, we have invested in a number of such projects and generally achieve a pay back in less than five years.
> 3. There are now a number of performance league tables, such as those produced by People and Planet that rank universities on environmental performance.
> 4. Many universities, including Y, have made a commitment to operate in a sustainable way.
> 5. Students expect universities to behave responsibly, and this includes eliminating or reducing waste, whether through energy, packaging etc.

The third most influential driver for universities is 'Energy prices' with a mean value of 4.14. Universities seem to be very concerned about the volatility in the energy market and price increase, as it can affect their profit margin. So, many of the respondents ranked it as third most important driver for strategic carbon management and it directly links with the first driver, financial savings. This has further implications in terms of taxation, as identified by the Assistant Director (Engineering and Maintenance) above. In response to a post at the Carbon Trust Public Sector Carbon Network, the Head of Sustainability at a Russell Group University argued that increasing energy prices have significant impact on research intensive universities and finance directors understand this issue now.

This might not be the primary financial issue, pensions for example, but it's still significant. The finance director understands we should address this and notes what is spent in this area will come back in 'spend to save' projects. This may be less of an issue for teaching universities, but I would think comparatively it is important.

The respondents ranked the HEFCE policies and strategies as the fourth most important driver for their universities. It has a mean value of 4.06.

> *"HEFCE guidance and regulations (especially link to CIF2) made a big difference, need them to keep pushing the sector. Slow progress being made but in the right direction"* [Environmental and Cultural Change Manager]

After the change in funding mechanism where main source of funding is students' fees, the HEFCE's strategic influence might be reduced due to the focus on the business, i.e. recruiting more students, provide student experience, compete in the global marketplace and increase financial sustainability. The Principal Teaching Fellow at a pre-92 Russell Group University commented that universities have demonstrated commitment to carbon reduction as a result of HEFCE's policy and for compliance reasons. His comments support the above argument:

> *"I fear that once all HEIs realise that HEFCE will not penalise them for failing to meet their targets, then commitment to carbon reductions will fall"* [Principal Teaching Fellow]

'Reputation and market position' has a mean value of 3.68 and is the fifth most important driver. This could have further implications for staff and student recruitment and retention and the overall HE business. However, reputation in carbon management may not be that helpful in business, similar to university reputation in international ranking league tables. Interestingly, climate change and doing the right thing are not very important to universities. They were found as drivers with medium level of importance. This could indicate that universities are business oriented organisations. Criticism in the media, pressure from Non-Governmental Organisations (NGOs) & other groups and student/staff recruitment and retention were the least important drivers for carbon management according the respondents. Their mean values are 2.45, 2.47 and 2.93 respectively. However, in response to a post at the Public Sector Carbon Network, the Head of Sustainability at a Russell Group University argued that student experience might not be enough in driving the agenda forward.

There is of course the student experience angle, but this might not be enough to keep this on the agenda.

There are various other important drivers and the detailed statistical results with mean value, standard deviation and skewness and kurtosis are presented in Table 53 below. 'N' shows statistical numbers of the respondents answering this particular question.

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Climate change	111	1	5	3.38	1.184	-.407	.229	-.551	.455
Do the right thing	111	1	5	3.45	1.059	-.381	.229	-.376	.455
Laws and regulations	111	1	5	4.22	1.048	-1.460	.229	1.667	.455
HEFCE policies & Strategies	112	1	5	4.06	1.059	-1.284	.228	1.325	.453
Organisational policies	110	1	5	3.23	1.064	-.376	.230	-.430	.457
Energy prices	112	1	5	4.14	1.138	-1.444	.228	1.460	.453
Financial savings	112	1	5	4.27	1.123	-1.753	.228	2.402	.453
Reputation and market position	110	1	5	3.68	1.066	-.673	.230	-.145	.457
Student & staff recruitment and retention	110	1	5	2.93	1.131	.029	.230	-.638	.457
Healthier and comfortable learning environment	111	1	5	2.95	1.077	.198	.229	-.607	.455
Pressure from NGOs and other groups	110	1	5	2.47	1.002	.160	.230	-.571	.457
Criticism in the media	110	1	5	2.45	1.063	.472	.230	-.398	.457
Aspirational drivers	109	1	5	3.17	1.129	-.115	.231	-.724	.459
Own Key Performance Indicators (KPIs)	111	1	5	3.51	1.299	-.499	.229	-.820	.455
Valid N (listwise)	103								

Table 53: Ranking of drivers for strategic carbon management

6.11.2. Ranking of barriers to strategic carbon management

Despite the drivers, there remain a number of barriers to implement strategic carbon management. The first phase of the research explored the barriers to strategic carbon management. Similar to the drivers, a comprehensive list of the key barriers was produced for ranking. The ranking helps in exploring the nature of each barrier and ultimately, addressing it. It is noticeable from Table 54 that 'Lack of time and other resources' is the major barrier with highest mean value of 3.64. Other resources can be human resources. Universities seem to have less of these resources and the current staff seem to have a lack of time due to their main job role.

> *"It's a complex topic and I think sometimes people don't have time to engage with this"* [Health, Safety and Environment Advisor]

Small institutions might be facing the similar issues, such as a lack of time and allocation of resources. An Acting Director of Estates said that his university college is a smaller institution and went on saying:

> *"This is a small institution; environmental policy is a small part of one person's job. With the challenges currently facing higher education very little time and energy has been available to deal with environmental policy"* [Acting Director of Estates]

The respondents classed 'Complex buildings stock (Historical/listed buildings)' as the second most important barrier for universities. It has a mean value of 3.59. Many of the universities are facing this issue within their estates, particularly older universities. It is clearly a challenge to deal with this type of buildings. The third most challenging barrier for universities is 'Growing estate and business' with mean value of 3.58. Both smaller and larger universities are growing their business and are building the required infrastructure to address their business needs. This could lead to higher carbon emissions. After that, the majority of the respondents think that 'Lack of capital funding' is a fourth major issue for them. The mean value of this barrier is 3.39. The Head of Sustainability and Energy at a pre-92 Russell Group University stated that a lack of funding is one of the key issues and also argued that there is a lack of industry evidence to justify medium return on investments.

> *"Lack of funding and industry evidence to justify medium return on investments projects such as building refurbishment (15-25 years)"* [Head of Sustainability & Energy]

An Energy Manager supported this argument and said that the university's estate is subject to a strategy review and it is difficult to invest in the short term in energy saving projects since there is no final decision on which buildings will be retained or disposed of. This issue seems to link with strategic decision-making. An Assistant Director Environment at a pre-92 university described that a lack of resources is a barrier to act on carbon emissions in this financially tight environment, even though they have strategic intentions.

> *"The overall financial position has led to all Departments having to reduce their budgets including not filling posts or a 6 month delay in filling posts. These factors combined with minimal resources for this function in the first place means, the intentions are there, but the resources only allow very slow and sometimes faltered progress"* [Assistant Director Environment]

'Priority to core business' has a mean value of 3.28 and is classed as the fifth important barrier. The Director of Sustainable Development at a post-92 university argued that the "*main barrier is inability to integrate it into student experience".* The results indicate that 'Lack of senior management commitment' is considered as a barrier with mean value of 2.94. The respondents perceive 'Lack of knowledge and expertise' as the least important barrier and they do not seem to class it as a major problem having mean value of 2.26. 'Financial accounting rules within the university' (Mean value=2.63) and 'Low carbon/energy efficiency market complexity and fragmentation' (Mean value=2.44) were not classed as of high importance as the other barriers and only two interviewees mentioned this. During a discussion, a senior manager at the Carbon Trust argued that the current technology market from where universities procure energy efficiency products and services has become complex. This was followed up with the representatives from HE and the technology providers and they agreed that the market has changed in response to an increasingly substantive policy, regulatory and subsidy-driven landscape. The main consequence is that the 'market' is now saturated and products are even being mis-sold. This may cause confusion among university managers while procuring energy efficiency products and can impact carbon management practices in universities and wider public sector.

> "T*he market is now saturated by companies selling all sorts of energy saving ideas. The public sector needs to be very vigilant in determining and proving the claim"* [Energy Manager]

Similarly, the National Sales Director of one of the technology companies stated:

> I agree that there are many poor quality energy saving products in the market as there are people selling them. Here today and gone tomorrow as they say, where your guarantee is worthless" [National Sales Director. [Dated: 25/07/2013]

In contrast, the Sustainability Director responded on this issue in a LinkedIn message, indicating a role of academics in collaborative work with estates.

> I think on this query I'm quite lucky. At the university, we are always willing to trial technologies, but we do eliminate lots of products and claims, because I pass them to engineers and academics who are quite good at spotting things that I never would. [Dated: 03/02/2014]

However, all of these issues present themselves as barriers. The respondents also think that there is a lack of strong policy framework for implementing carbon management as the mean value of this factor is 2.87. This could have impact on university strategies. The Carbon Reduction and Energy Manager at a post-92 university quoted on the lack of strong policy framework:

> *"Lack of Government vision and direction, continual weakening of energy related legislation and mixed market signals"* [Carbon Reduction and Energy Manager]

The above respondent, Carbon Reduction and Energy Manager, provided critique on the government policies in an email. He was of the view that the previous government set out a strategy to de-carbonise energy supply and to increase energy efficiency across businesses, industry and homes with clear goals, strategies, legislative drivers and incentives, which gave market security and drew

investment, but now every aspect of this has been either ‘ditched, watered down or undermined’. The Director of Sustainable Development at a post-92 university stated that universities have not been able to integrate carbon management into student experience.

> *“Main barrier is inability to integrate it into student experience”* [Director of Sustainable Development]

All of the mean values are less than 4, which is not the case for the drivers. It appears that university managers do not perceive barriers as major hurdles. The barriers are in Table 54 below with their mean values, standard deviation and skewness & kurtosis.

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Lack of capital funding	111	1	5	3.39	1.273	-.254	.229	-1.024	.455
Lack of time and other resources	111	1	5	3.64	1.174	-.841	.229	-.039	.455
Lack of senior management commitment	110	1	5	2.94	1.229	.153	.230	-.887	.457
Lack of strong policy framework	110	1	5	2.87	1.257	.216	.230	-.845	.457
Financial accounting rules within the university	108	1	5	2.63	1.235	.378	.233	-.806	.461
Growing estate and business	110	1	5	3.58	1.377	-.603	.230	-.952	.457
Complex buildings stock (Historical/listed buildings)	110	1	5	3.59	1.236	-.509	.230	-.785	.457
Priority to core business	109	1	5	3.28	1.146	-.109	.231	-.585	.459
Lack of knowledge and expertise	110	1	5	2.26	1.155	.777	.230	-.180	.457
Low carbon/energy efficiency market complexity and fragmentation	109	1	5	2.44	1.040	.539	.231	-.237	.459
Staff and students' resistance to behavioural change	110	1	5	2.81	1.169	.275	.230	-.717	.457
Valid N (listwise)	107								

Table 54: Ranking of barriers to strategic carbon management

Moreover, the Director of Sustainability at a post-92 university not only ranked all of the above barriers, but also listed some of the additional barriers to carbon management in the university. These are capital and operational divide, shorter payback period and lack of future thinking.

> *"Key barriers: the capital and operational divide (eg: one person responsible for the new building/refurbishment and another for the operating costs over the lifetime of the building including maintenance, access etc); the short pay back periods (eg: most buildings are constructed only for 60 years, even so pay back periods are calculated for 3-5, sometimes 7 and rarely 10-12 years) and the lack of future thinking (e.g. extreme weather events management and business continuity costs are not factored in)"* [Director of Sustainability]

6.12. Discussion

This chapter has provided further insights into the current state of SCM, drivers and barriers by discussing various themes and sub-themes related to organisational management, culture and engagement. One could point to a number of initiatives that distinguish the performance of HE. These include carbon management plans & strategies, carbon footprinting & reporting procedures and implementation of low carbon projects, which is at the leading edge in the public sector. Universities have started implementing carbon management, but there is still a long way to go, complementing the findings of EAUC et al. (2015b) where Scottish universities' performance is measured. Carbon management is considered as a strategic process, which aligns with HEFCE (2010b) stating that carbon management is a key strategic issue for universities. Despite the managers' claims, it seems unclear how it links with actual practices. The responses suggest that the sector is committed and working towards implementation. There is evidence that the UK public sector has a leading role to play (The Carbon Trust, 2013) and universities are a key part of it. Therefore, the sector considers itself to have potential to lead in the public sector, also suggested by Carbon Credentials (2015). Universities are facing different challenges to reduce emissions and universities are trying to overcome these challenges (see Section 6.11.2). Overall, there was a conflict between participants' opinions on the success and performance of SCM, but institutions have recognised that they are well placed to take on a leadership role (Klein-Banai & Theis, 2013).

The engagement of senior management leadership is a core part of the action plan and places carbon management at the heart of the organisation's strategic and operational approach, but this is challenging (Energy Saving Trust, 2009). Senior management leadership varies in the universities based on the opinions of the interviewees; in some universities, managers have support of senior leadership and, in contrast, some universities do not have it. In general, the leadership is not visible. This complements the argument presented by Wehrmeyer et al. (2009) who state that clear board-level responsibility and accountability is required for delivering carbon management. However, the majority of universities only class carbon management as a strategic issue due to policies and its

strategic importance for the business. There are potential conflicts between carbon management and core business activities. These conflicts can be difficult to manage and carbon management can despair at strategic level due to a lack of senior management leadership. Tilbury (2011) argued that universities seem to be committed to transform the sector towards sustainability, but it is disconnected from the core business. Carbon management is not being embedded in the core business (Butt, 2014). HEFCE also recognised tensions between carbon management and competing business activities (HEFCE, 2009b). It was commented during the sustainable development strategy consultation that the HEFCE strategy ignores tensions that exist, for example international travel by staff and students and the campus-based model education raises concerns for carbon management. This is one of the major issues. However, these tensions should be considered by universities and it is beyond the role of HEFCE to provide definitive solutions to address them (HEFCE, 2009b). It demands high level strategic discussions and recognition to prioritise and manage the balance between conflicting priorities, where financial sustainability remains the key focus. Moreover, it is not prioritised over the core business in this customer driven competitive HE market, especially in the new financial regime, where students are at the heart of the system (Department for Business, Innovation and Skills, 2011). Universities appear to be business oriented and the focus is shifted to provide good research and teaching experience to students. Williamson (2012) argues that university administrators are working under various constraints and may find it challenging to balance investment of time and funding to mitigate carbon emissions, let alone broader institutional priorities. Strategic decision-making power belongs to senior leadership, where estate managers do not have any control over it. They are not a part of decision-making; therefore, engagement of senior management is crucial. Carbon management is not central to the strategic decision-making and management procedures, but the majority believes that it should be part of it, suggesting a gap between strategic intention and implementation. Okereke (2007) argues that it is the responsibility of leaders to carry out strategic assessment of the potential impacts on climate change and take actions. HE has skilled individuals to deliver carbon management, but middle managers cannot influence strategic policies. Cunningham and Harrington (2006) reported that the role of middle managers has changed significantly. Organisations have become smaller by cutting staff and middle managers feel that their position in organisation is becoming less important and less strategic. This indicates disjointed management approaches in universities.

Funding is a key element for the implementation of carbon management. At present, availability of funding is a key barrier (see section 6.5) and managers are of the view that more funding is needed. Carbon Credentials (2015) also suggested more capital investment to meet 2020 targets. In contrast, a minority of the interviewees argued that funding is not a problem due to availability of low and no cost carbon reduction initiatives as suggested by the People and Planet (2014b). This complements the

view of Spirovski et al. (2012) and HEFCE (2010a) who encourage universities towards low or no-cost energy and carbon reduction opportunities such as behaviour change, engagement and space management. This could have significant impact on carbon management. However, large amount of funds are required for big projects. As discussed in the content analysis, universities are using multiple sources of funding via internal and external sources. As there are challenges around funding, many universities have not only internal budgets, but they also utilise various external sources such as interest free loans and grants from various agencies. Public spending might always be limited and the government has to prioritise different agendas similar to the individual universities. Unlike other policies, energy efficiency policy creates a return on investment, which could offset the cost (Mallaburn and Eyre, 2013). The same principle could be applied in universities to drive investment and gain return on investment. In light of strategic conflicts and lack of priority, managers have to compete against core business activities. Due to this, universities have low priority to carbon management and might not be in a position to invest significantly.

Chapter 5 found that universities have started to consider carbon management and developed CMPs. EAUC (2016) reported that carbon management is evolving in universities. CMPs have given consistency among universities despite the fact that some managers believe that these plans need to be further improved. Robinson et al. (2015) argue that many institutions are expanding in terms of student numbers and size and these changes are not taken into account while developing CMPs. The boundary of emissions measurement and management is important when it comes to carbon management planning and targeting. At present, universities are focused on scope 1 and 2 emissions in their carbon accounting, targeting and plans due to availability of data of scope 1 and 2 emissions. However, many of the universities have adopted plans and approaches for scope 3 emissions measurement and management. The sector is behind in scope 3 carbon management and universities are not considering 'low carbon' element in procurement activities and other scope 3 emissions (Lozano, 2011). Scope 3 emissions are complicated and gathering of accurate data is challenging. There is currently no standard methodological approach to carbon accounting for the sector. In contrast, few universities have measured parts of scope 3 and have set the targets. The selected parts of scope 3 emissions are waste and water because the data are available. Scope 3 is considered challenging in terms of data and universities are first trying to collect the data and then measure it. Universities might not be focused on scope 3 because these are not mandatory yet. Despite this, the majority of the managers agree that universities can influence scope 3 emissions. Furthermore, there are tensions between carbon management and scope 3 streams particularly related to business travel, international student travel and procurement and supply chain.

All of the universities have set targets to respond to the sector and national targets. However, the collective targets of universities do not meet the overall sector target (HEFCE, 2013a), which indicates adoption of a strategic and proactive approach. Individual targets vary in universities based on their capability to meet them. In general, targets are useful for universities and could keep universities focused in their carbon management journey and measure the progress quantitatively. The issue of absolute and relative targets received much attention in this study. Universities need to work on absolute reductions instead of relative due to the HE and national targets. Estate development and business growth is one of the challenges and a barrier because universities are growing in business (research, teaching and student numbers). This is challenging for a growing university to manage the balance between carbon management and growth indicators, as found by Sullivan (2009). Universities that are conducting scientific research have particular problems associated with equipment and laboratories as well as infrastructure development. Universities cannot stop doing research only to reduce emissions, which poses a challenge to many universities. Energy and carbon intensive research is itself a challenge mainly for the Russell Group of universities which have higher research income than other universities (see Figure 27). These universities may struggle to meet the absolute targets. Relative targets are not encouraged because these targets do not offer actual reductions. Even though universities grow enormously, relative emissions can be reduced despite being carbon intensive, but absolute emissions are not reduced. Absolute reductions are simpler to communicate to stakeholders and guarantee a particular outcome, regardless of growth in area.

The Estate Management Statistics (EMS) 2010 report states that there has been a significant increase in student numbers and the HE estate (HEFCE, 2011). The sector growth could be a part of the problem, as increase in carbon emissions is attributed to campus growth (Spirovski et al., 2012; Andrews et al., 2015). Robinson et al. (2015) suggested that appropriate KPIs need to be used to promote realistic target-setting. Carbon reduction targets can be developed based on KPIs such as business/financial metric i.e. revenue, number of employees or floor area to ensure fairness and comparison across universities, whilst representing a more practical methodology. In contrast to absolute national and sector targets, Robinson et al. (2015) support relative targets and universities feel that their specific circumstances need to be taken into account while setting targets (Riedy and Daly, 2010). Currently, this is not happening. Barker (2013) argued that universities set targets which can be based on aspirations and it can be an easy trap to fall into and setting difficult targets can lead to failure. High ranking Russell Group universities are at the bottom of the UL (People and Planet, 2014), due to high energy and carbon intensive research. The UL is criticised due to its criteria, the methodology and lack of fairness. There has been debate on this topic and the methodology has even been revised, but still, there are issues around it. The use of relative targets in the ranking is one of the

problems, because energy and carbon intensive universities always have higher carbon emissions per head than a teaching university.

Stakeholder engagement, particularly staff and student engagement, is a crucial part of the SCM process. Universities are employing various strategies to enhance engagement, but a lot of progress needs to be made and unfortunately, the process seems to be slow. There appears to be a lack of interest among staff and students. This can be due to a lack of knowledge and understanding, lack of time and more focus on core activities. Behaviour change of staff and students is presented as a barrier. Gerrard (2009) is of the same view that attitude and behaviour change at the individual level seem to be insufficient to deliver zero carbon future and furthermore, technical solutions have human components attached to them. However, behaviour change is one of the most cost-effective ways to save energy and manage carbon emissions (Spirovski et al., 2012). Dahle and Neumayer (2001) described staff and students as careless in regard to carbon management and academics are considered uninterested and too busy with academic work to participate in the process. These stakeholders need to know what is in this agenda for them and how they could contribute to the process. In contrast, HEFCE (2014) suggests that students are now better informed about environmental risks and its management. Therefore, many students care about the environment and view sustainable development as an important issue. The issue of complex and historical listed building stock emerged as a barrier. Altan (2010) argued that tackling HEIs' energy and carbon reduction is challenging and complex due to the heterogeneity of the sector. Due to this, managers can do limited work on these types of buildings due to restrictions.

The responsibility for carbon management is dispersed in universities. Managers in estates department believe that the responsibility rests with everyone in the university, but estates are mainly responsible for implementing strategies. The ownership of staff and students is emphasized by the managers, because environmental teams argue that carbon management is not only their responsibility and all of the stakeholders need to take the ownership. The ultimate strategic responsibility lies with senior management team or vice chancellor of the university, but their full participation has been lacking and is restricted to only policies and strategy commitments. The middle managers in estates implement the strategies because of their official job remit. However, the official responsibility for carbon management varies and managers can have different job titles depending upon the organisational structure of the university suggesting a lack of clarity over responsibility. The line of responsibility also varies in universities.

6.13. Conclusion

This chapter completes the first phase of the research by providing insights into the role of universities in implementing SCM. The qualitative phase helps gain an understanding of the SCM process from stakeholders' perspective. The analysis provides deeper understanding of the processes, approaches, and experiences of managers within their organisations as they sought to implement SCM. The study suggests that HE carbon management is moving in the right direction, but there is a lot more to be done despite the fact that universities have done better in some areas. While HE as a whole has demonstrated both policy and strategy commitment to carbon management, the performance of individual universities varies significantly and there is often a need to embed the process more effectively. This chapter has mapped out the drivers and barriers to implementing SCM in universities. To see how these factors play in even more detail, an in-depth case study of DMU is presented in the next chapter. Table 55 and 56 present the collective key findings from Chapter 5 and 6 to meet the research objectives, as both research methods inform each other.

No	Objective	Key research findings	Themes/CSFs
2	To assess university levels of compliance and adoption of the latest carbon management policies and explore the current state of strategic carbon management in HE	• Almost all of the universities have developed CMPs. CMP is a valuable tool that has put universities on the pathway of carbon management; otherwise prior to that, there was no significant activity in universities. However, CMPs predominantly discuss only operational issues rather than strategic. Technical projects and details are dominant with less emphasis on strategic, non-technical or human factors. CMPs are not engaging and publicly facing. CMPs are also not dynamic and uncertainty in future scenario is not incorporated in their development. (see Section 5.4 and 6.8) • Carbon management has started to rise up at the strategic management agenda and universities have shown 'on paper' policy commitment. However, performance varies significantly. Senior management leadership is a critical factor; in some universities, managers have support of senior management and some universities have a lack of leadership. In general, senior management leadership is not visible and their role has been limited. Carbon management is considered strategic, but it is unclear how it is translated into practice. While universities have developed policies and strategies, they need effective delivery. It is not central to strategic decision-making and management and remains marginalised. In addition, carbon management is not prioritised over the core business in this competitive HE market, especially in the new financial regime. (Section 5.6 and 6.4) • Stakeholder engagement, particularly staff and students, is a critical factor for implementing carbon management. Universities are focused on enhancing staff and student engagement through various behaviour based programmes and strategies, but there is a lack of effective engagement and substantial progress needs to be made. (Section 5.11 and 6.8) • The responsibility for carbon management varies and is quite dispersed depending upon university structure indicating a lack of clarity. Officially, the operational day-to-day responsibility lies with middle managers in the estates department; whereas strategic responsibility lies with a senior manager or Director of Estates or Vice Chancellor, but their role is unclear as is their level of participation within the carbon management	Strategic management, Senior management leadership, Funding, Boundary of carbon management, Estate development and growth, Types of targets, Stakeholder engagement, Responsibility, Evaluation and reporting

		process (See Section 5.13 and 6.10). • There is inconsistency and complexity in the existing measuring and reporting systems. There is a range of methods and tools to measure carbon emissions and report performance, each being different. There is currently no standard methodology for comprehensive carbon accounting and universities are only focused on scope 1 and 2 emissions in carbon accounting, targeting and planning. However, selected parts of scope 3 emissions are measured by many universities, but they are lagging behind in dealing with comprehensive scope 3 emissions. Universities have developed absolute targets, but there is criticism on absolute targets due to inherent contradictions with business growth. Universities are also using relative targets for reporting. (Sections 5.12, 5.9, 6.6 and 6.7)	

Table 55: Findings from objective two

No	Objectives	Key research findings	Themes/CSFs
3	To explore the drivers for and barriers to strategic carbon management within the HE sector.	• Financial savings and government policies and regulations are the most important drivers for carbon management. The other drivers are increasing energy prices, HEFCE policies and strategies and reputation and market position in the sector (see Section 6.11.1). The drivers have almost similar impact on both pre-1992 and post-1992 (including Russell Group) universities in the UK (see Appendix 9). • Lack of time and resources (HR), complex, historical and listed buildings stock, estate development and business growth, lack of capital funding, priority to the core business and potential conflicts, lack of senior management leadership and lack of knowledge and expertise are the major barriers to carbon management (see Section 6.11.2). However, lack of capital funding and complex, historical and listed buildings stock exist more in Russell Group universities (see Appendix 9).	Policies, Funding and resources, Reputation and market position, Senior management leadership, complex, historical and listed buildings, estate development and business growth, Core business priorities and conflicts

Table 56: Findings from objective three

Chapter 7: Strategic carbon management at De Montfort University: A case study

7.1. Introduction

This chapter presents an in-depth case study of the strategic carbon management (SCM) process at De Montfort University (DMU). This is also the second phase of the research and is based on the key themes from the thematic framework developed in the first phase of the research. The case study is aimed at understanding how a university might implement SCM through a whole-organisation approach. The case study investigates how the SCM process has progressed at DMU. It also explores the perceptions and approaches of stakeholders, particularly senior management. The study also explores the key features to effectively implement and embed SCM within a university i.e. critical success factors (CSF) and at the end of this chapter, key findings arising from the case study are discussed in relation to the previous findings which set DMU in context of wider HE sector.

7.2. Why De Montfort University (DMU) as a case study?

De Montfort University (DMU), UK was chosen as a case study because at the outset of this research, it had declared a strategic commitment to integrate sustainability into the mainstream culture of the organisation (Bull et al., 2011). DMU's Sustainability Strategy 2009 highlights the role of measuring and monitoring the environmental performance and carbon emissions to implement the carbon management plan (CMP) (DMU, 2014a). A key objective of the DMU's strategic plan 2011-15 was that during the next ten years the university aims to make a major contribution to the society's efforts to achieve environmental sustainability and be a leader in HE (DMU, 2011a). In late 2015, a revised strategic framework 2015-20 was launched without specific reference to environmental sustainability or carbon management. This apparent shift is reflected upon in the conclusions. Table 57 presents the general statistics of DMU from 2009/10 to 2013/14 and demonstrates scale of the problem.

Indicators/metrics	2009/10	2010/11	2011/12	2012/13	2013/14
Income/turnover	£149.88M	£149.43M	£146.99M	£152.66M	£160.79M
Student numbers	22,457	22,411	22,192	20,473	20,423
Staff numbers	3,350	3,083	2,950	2,871	2,730
Gross Internal Area (GIA) (m^2)	167,583	157,713	151,669	163,224	160,625;

Table 57: General statistics of DMU (DMU, 2015a)

During the period of the 1st Strategic Plan though DMU developed individual policies and strategies in most areas of carbon management such as energy policy, green travel plan, waste management policy, sustainable procurement policy and CMP (explanation is in appendix 10). DMU has set targets for scope 1 and 2 and scope 3 emissions. DMU was the first English university to calculate its

consumption-based carbon footprint (Ozawa-Meida et al., 2013). Consequently, HEFCE consulted DMU to work on producing guidance for calculating scope 3 emissions. DMU, Arup, a global consulting firm, and the Centre for Sustainability Accounting (CenSA) were appointed to work on procurement (supply chain), waste and water related emissions and they produced the guidance for universities to calculate and report scope 3. This was leading work on scope 3 emissions in the sector. As far as the targets were concerned, DMU met its first interim target of 12% carbon reduction by 2012 as per the baseline of 2005/06. Furthermore, the university has been continuously improving its environmental and sustainability performance in the University League and was placed 11th out of 151 UK institutions in 2014. This is the highest position DMU ever held. DMU has also won and been a finalist in the Green Gown Awards for its energy and carbon related projects. The collaboration of the estates department with the Institute of Energy and Sustainable Development (IESD) appears to be positive for the future success of SCM at DMU.

Finally, and this is not without complications, DMU is the home university for the researcher and it provided practical access to facilitate the data collection. Sufficient time is given to conduct the case study, because the researcher is based in the IESD at DMU and was continuously co-ordinating with the estates and the other relevant departments. Being a student of DMU was advantageous for carrying out the data collection process and links were developed with the management involved in SCM process. The researcher volunteered in greening projects such as Green Impact to help develop a close working relationship with the estates managers and to gain a better understanding of how bottom-up strategies are implemented. All of this contributed to the case study investigation. DMU seemed to be an ideal case for doctoral study focusing on organisational aspects of SCM. Other universities have success stories in different areas of carbon management, but these particular achievements and characteristics make DMU a distinguished case to explore and produce insights for wider learning. DMU case study did not involve any travelling and financial cost.

7.3. Research methods

The data was collected from multiple sources including content analysis, semi-structured interviews, questionnaire surveys, participants' observations, informal discussions and social media. The SCM framework is used as a conceptual framework in the case study and the themes of senior management leadership, funding and resources, governance and stakeholder engagement are explored as they appear to be the most common and most important themes throughout this study. However, some new themes also emerged. The departments and individuals contributing or underpinning these new themes were interviewed to explore integrated approaches to SCM from the perspectives of different stakeholders in the same university. These individuals were better positioned to provide insights into

the process due to their primary role and responsibilities. The DMU survey responses are included in this chapter and both support and contradict the case study findings. Nine respondents completed the survey at DMU. The Sustainable Development Task Force (SDTF), a cross faculty and departmental body at DMU, held meetings which the researcher attended to gain insights into the strategic approaches to carbon management and the role of different stakeholders. The agendas, minutes and documents of the SDTF meetings were analysed to triangulate with other sources of data such as the minutes of the Board of Governors. DMU's policies and strategies were critically reviewed to explore SCM process. Informal discussions with senior and middle managers and excerpts from social media also made part of the data collection. The researcher also attended various meetings including the environmental champions' and CMP review meetings and events, to add to the data required to complete this study. Table 58 presents the interviewees, type of the interviews and purpose.

No	Case study interviewee	Type of interview	Purpose of the interview
1	Director of Estates	Face-to-face	Understanding SCM into the estates operations, strategic issues around SCM
2	Director of Finance	Face-to-face	Understanding integration of carbon management into financial and procurement activities and decision-making, availability of funding
3	Head of IT Operations	Face-to-face	Understanding integration of carbon management into ICT operations, exploring whole-organisation approach and engagement
4	Deputy Vice Chancellor	Face-to-face	Strategic perspective of senior managers on carbon management, role of carbon management into strategic decision-making and management
5	Pro Vice Chancellor	Face-to-face	Strategic perspective of senior managers on carbon management and the role of SDTF, role of carbon management into strategic decision-making and management
6	Energy Manager	Face-to-face	Operational perspective and governance of scope 1 and scope 2 carbon management, role of scope 3 carbon management
7	Senior Media Officer	Face-to-face	Role of communication in SCM, means of communication being used at DMU, Engagement
8	Vice President Welfare	Email	Role of DSU in SCM, Student engagement
9	Vice Chancellor	Live chat/Phone	Strategic perspective of the VC on carbon management at corporate level

10	Environmental and Sustainability Officer	Face-to-face and Emails	Exploring operational perspective of SCM and governance related issues
11	Director of People and Organisational Development (POD)	Telephone	Integration of carbon management into People and Organisational Development (POD) operations including human resources (HR), How do POD respond to carbon management

Table 58: Case study interviews, type and purpose of interviews

7.3.1. Environmental benchmarking – University League

With regards to success of DMU, it is ranked amongst the greenest universities in the UK by the People and Planet over the last few years. DMU was placed 11th out of 151 institutions in 2015. It is the fourth year in a row that DMU was given a 'First Class Award'. DMU scored 60% in the category of 'Carbon Management', because the current CMP does not include a baseline and reduction targets for scope 3. However, the updated CMP aims to include this. The university scored 38% in 'Carbon Reduction' suggesting that it needs to improve in yearly reduction of carbon intensity and emissions reduction as compared to the 2020 target (People and Planet, 2015). However, in the January 2015 SDTF meeting, the Environmental and Sustainability Officer noted that this was a good result considering the league had undergone a major review resulting in a change in scoring criteria to improve the robustness of the league and ensure that all institutions are fairly represented.

Members of the SDTF discussed areas in which DMU could improve the score in future. DMU aims to hit the top five in 2016. This suggests that the university seems to be concerned in raising its profile and reputation and is keen to work on carbon management as long as it is good for business. In addition, the ranking in the UL gives reputation within the sector and beyond. Two of the interviewees (both senior managers) discussed the role of the UL during the interviews. The PVC argued that the league tables such as the UL does not have the same impact as other league tables such as Times Higher Education and Guardian, as they have more impact on potential students. Despite this, 151 universities and colleges participated in the UL in 2015. The PVC suggested that carbon management should be part of league tables due to their impact on universities.

> *"If you really want universities to focus strongly on it, then it needs to be part of the top league tables. We respond to the Times Higher Education, the Sunday Times and the Guardian league tables. We respond directly to them. We don't respond in the same way as University League table. The fact that we went down in the University League did not have the same impact"* [Pro Vice Chancellor]

7.3.2. Environmental Management System (EMS)

An Environmental Management System is a coherent and integrated system that records and monitors an organisation's environmental and carbon management performance. DMU implemented an EMS which covers the entire campus and seeks to provide a tool for an integrated approach to carbon management. Despite the advantages, EMS can be resource intensive and requires funding to achieve external certification. DMU has successfully achieved phase 4 of the British Standard BS8555 (ACORN) and is the equivalent of EcoCampus Gold standard. According to the Environmental and Sustainability Officer, DMU did not apply for EcoCampus for financial reasons. Both ACORN and EcoCampus are designed for a phased implementation of an EMS, but only one was required. It was planned that the university will work to gain phase four and five in preparation for auditors' visit in summer 2015, but it was not completed indicating a gap between planning and implementation. It was anticipated that the EMS will be fully implemented in 2013/14, but this is still not done indicating slow progress. Only phases 1-4 were obtained in summer 2015 due to lack of resources, as indicated by the Environmental and Sustainability Officer:

> *"We are part way there with the implementation of an EMS. The next phase of ACORN is Phase 5 which is the internal audit process which requires an annual audit against all relevant environmental legislation and the requirements of the EMS standard being sought. This is a very resource intensive step. The external auditor when he visited suggested that an organisation of a similar size and complexity would have 10-13 people working on these issues"* [Environmental and Sustainability Officer]

7.4. Carbon reduction targets

DMU has set its ambitious targets for reducing emissions from energy use and own vehicle (scope 1 and 2) by 43% by 2020 based on its emissions in 2005/6 baseline. There are also interim targets of 12% reduction by 2012 and 29% by 2017 to ensure regular review process. DMU has agreed and adopted a target of 20% for scope 3 carbon emissions sources (procurement, business travel, waste, water, staff and student commute and international student) by 2020 based on a 2005 emissions baseline. In contrast, not many universities have set carbon reduction targets for scope 3 emissions, which distinguishes the position of DMU in the UK HE sector.

Environmental Area	Target	Date	Officer contact
Transport	Below 45% single occupancy car journeys for staff	Ongoing	Transport Co-ordinator
Sustainable procurement	Achieve Sustainable Procurement Flexible Framework Level 2	Dec 2015	Environmental & Sustainability Officer, Procurement Manager
Waste	Recycling 75% of non-residential waste Recycling 85% of non-residential waste	2015/16 2017/18	Post & Porterage Manager
Water	Water consumption of 3 m^3 per student	2014/15	Energy Manager
Carbon emissions (scope 1 and 2 sources)	29% reduction based on 2005 baseline 43% reduction based on 2005 baseline	2017/18 2020/21	Environmental & Sustainability Officer
Carbon emissions (scope 3 sources)	20% reduction based on a 2005 baseline	2020/21	Environmental & Sustainability Office

Table 59: Environmental and carbon management targets (SDTF, 2014[11])

Table 59 provides environmental and carbon reduction targets of DMU. Many of these targets are already in place and are reported to senior management via the SDTF. These targets address all dimensions of SCM. In DMU, the person responsible for carbon reduction is the Environmental and Sustainability Officer; whereas, in many other universities it is the role of the Energy Manager. Table 61 does not show the Energy Manager as being the contact officer for carbon emissions, which indicates carbon management is not his main role. Moreover, Environmental and Sustainability Officer is the only person dealing with scope 3 emissions. To give quantitative figures of emissions, appendix 10 presents DMU's total emissions from detailed sources of scope 1, 2 and 3 during 2005-12 (tCO_2e). It presents DMU's carbon reduction performance summary as per the Brite Green's study, which is a sustainability strategy consultancy.

7.4.1. Progress against the targets

DMU has set ambitious targets, but the challenge is to meet these targets. According to the Energy Manager, DMU is on its way to achieve the 2020 carbon reduction target in absolute terms. He stated that the university is doing well and is currently just below the target line. The Environmental and Sustainability Officer advised that a report went to the SDTF a couple of months ago which details university's carbon emissions. However, the university did meet its 2012 target and the emissions for 2014/15 are 30% below the HEFCE baseline year figure. In contrast, the analysis of Brite Green (2015) shows that DMU is not currently on track to meet its carbon reduction targets, as shown in

[11] This table is taken from the SDTF meeting documents presented in June 2014.

Figure 30. If DMU's carbon emissions continue to increase at this rate, then achieving the carbon reduction targets can be difficult, despite having a detailed carbon management plan and strategies.

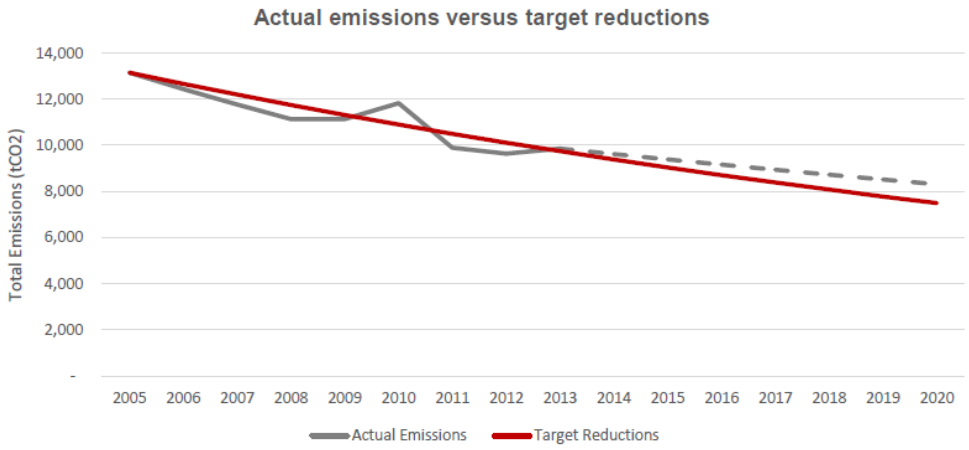

Figure 30: 2020 Carbon Reduction Target: Progress Report (Brite Green, 2015)

At the SDTF meeting in February 2014, a report was presented on the current performance in key areas of the university's environmental policy, which included waste and recycling, carbon emissions, business travel and staff and student engagement. The performance figures were provided and reference was made to existing performance against the targets for these areas. The details of the environmental and carbon performance in these areas are presented in the appendix 11. Carbon management policies and strategies are analysed in Appendix 10, which aim to deliver the targets.

7.5. Management structure

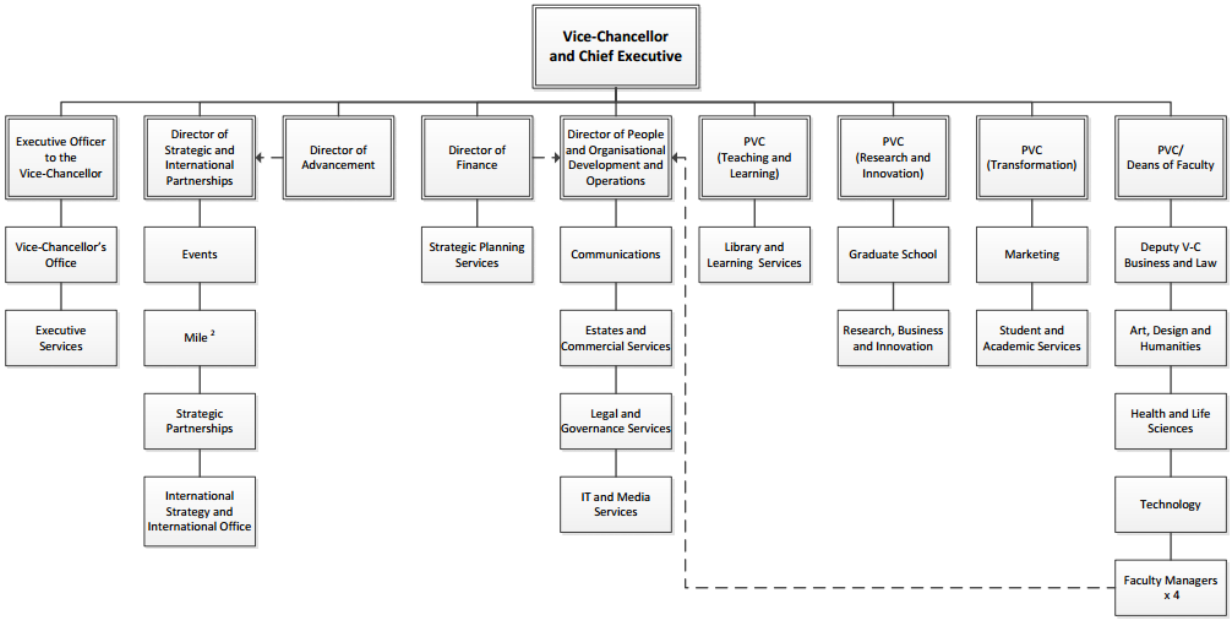

Figure 31: Organisational structure of DMU

Figure 31 presents the organisational chart (taken from the POD upon request) that identifies where responsibility for carbon management lies in the organisation. The formal responsibility rests with the Directorate of Estates and Commercial Services, led by the Director of Estates and Commercial Services. Estates and Commercial Services come under the Directorate of People and Organisational Development (POD) led by the Director of POD. With the exception of the Director of Estates and Commercial Services reporting to the Director of POD, the chart shows that most of the departments are working in isolation. The faculties and departments report to their governing department and none of the departments in the chart are actively involved in carbon management. There is no mention of the Director of Sustainable Development in the organisational chart and his role within IESD and wider university indicating a lack of clarity. To give a sustainability focus, the university developed a Sustainable Development Task Force (SDTF).

7.5.1. Sustainable Development Task Force (SDTF)

The Sustainable Development Task Force (SDTF) was created in 2007 and is a sub-committee of the Executive Board (EB). Its mission is to advise the VC and the EB on the implementation of the sustainability strategy. The SDTF reports to the Strategic Management Group which in turn reports to the EB and comprises of 16 members consisting of faculty and departmental heads, researchers, estates department and representatives from the De Montfort Student Union (DSU). It aims to re-position DMU as a leading university in sustainable development. It also aims at reducing running costs of the university and advises on the development of initiatives associated with DMU's sustainability strategy as well as monitoring DMU's and Leicester's environmental footprint SDTF compiles and reports on the university's environmental performance annually (DMU, 2015d). Most of the departments and faculties have representatives in the SDTF with the exception of the finance directorate, student services and academic quality. In addition, senior management and directorate level representation is considerably less, which contradicts the constitution of the task force. Table 60 presents members of the SDTF as at September 2014.

Pro Vice-Chancellor / Dean
Director of Sustainable Development (Chair)
Estates Representation (Director of Estates and Environmental & Sustainability Officer)
Director of Student Services
Finance representation
Marketing and Communications representation
De Montfort Student Union (Welfare Officer)

Information Technology and Media Service (ITMS) Representation (Head of IT Operations)
Academic Quality representation
Research, Business and Innovation Directorate
POD (e.g. Equality and Diversity Adviser)
Strategic Partnerships representation
Representative of Faculty Managers
Staff representation from each Faculty

Table 60: Membership of the Sustainable Development Task Force (SDTF)

The progress of the SDTF has been slow. On numerous occasions, meetings were postponed or cancelled and the rate of absence is quite high. In the meeting held on 24 February 2014, the Director of Estates stated that *"it is disappointing to see absence from the faculties"*, as there was only one representative from the Faculty of Business and Law. It was noted that the same issues are being reviewed repeatedly in meetings without any real progress being made. For example, it took a lot of time to revise and get final approval of DMU's updated sustainability strategy. Updating the CMP which was written in 2011 is in progress for a long time and there seems to be delay.

7.6. Senior management leadership

The first phase of this research found that senior management leadership is critical for universities wishing to implement SCM (Section 5.6 and 6.4). This section analyses the engagement of senior management and their approach within DMU. The survey findings suggest that the senior management at DMU is fully committed to the carbon management agenda for buying into the SCM process as four out of the nine respondents agreed and two strongly agreed on this issue. Furthermore, in response to related question on senior management engagement, five interviewees also agreed and three of them were members of the EB. However, the evidence does not support it. The senior management may be engaged in policy and strategy document, but there is a lack of actual participation.

> *"Senior management may be supportive of carbon management but how does that translate into actual practice? Are all of the new buildings as energy efficient as possible and do they achieve the highest rating in BREEAM or similar? Not at the moment"* [Environmental and Sustainability Officer]

Perhaps this suggests that there is a lack of effective leadership and clear distinction on who is leading on carbon management. DMU has a Director of Sustainable Development who sits in one of the faculties, but how does he work within a chain of responsibility is unclear, as discussed in Section 7.5.

7.6.1. Perceptions of senior management

This section explores the understanding and perceptions of senior management about carbon management. Section 6.3 presents mainly middle management's understanding of carbon management. In the case study, the focus was on the opinions of senior management. Eight participants were asked various questions about their general understanding and acceptance of carbon management. The majority of the interviewees cited it as an important issue and even the PVC defined carbon management:

> *"Managing our carbon footprint and minimising the emissions, scope 1, scope 2 and scope 3. Carbon management is an overall package what our carbon footprint look like and what are we doing as a university to try and minimise our carbon footprint"* [Pro Vice Chancellor]

The PVC indicated an understanding of carbon management and of the different scopes of emissions (scope 1, 2 and 3). This is likely to be because of his membership of the SDTF and acting as a bridge between the SDTF and the EB. The PVC was asked about the understanding of other members of the EB and his response is demonstrated in the extract below.

Researcher: Do you think senior managers in the EB understand carbon management and environmental sustainability agenda? **Pro Vice Chancellor:** I think in very broad terms, they do. I think if you ask any senior executive, they would be able to tell you in very broad terms about carbon footprint and carbon management. What they would not be able to do is break down into scope 1, scope 2 and scope 3. They probably would not be able to go to that level of detail. But, in very broad terms, they will all have appreciation of managing our carbon emissions. **Researcher:** Do they understand carbon implications for the university? **Pro Vice Chancellor:** Yes, I think so. I will be surprised if they did not. It is something they would not always automatically think about when you are coming up with a new initiative. It wouldn't be something a lot of people would immediately think to do with that initiative. But, if you ask them what would be the implications for our carbon footprint, they would be able to have a pretty good estimate I would say, whether it will go up or down.

Table 61: Interview extract demonstrating senior management's perspective

The above extract suggests that senior management may understand the term carbon management and its strategic implications, but they do not fully understand the complexities of the process and how they should engage with it. This contradicts the argument of Dembo (2008) who argues that senior management should have an adequate understanding of carbon management and associated risks and opportunities. Interviews with five members of the EB suggest that they each appear to have understanding of carbon management and they each recognise its strategic role. In addition, A[12] and

[12] 'A' is a senior manager who is part of the EB and is kept anonymous.

B[13] were also asked about how they view the role of carbon management in wider organisational management during informal discussions at two university events. The researcher did not receive any negative remarks regarding the role of carbon management and both A and B seemed to appreciate its significance. The Director of Estates, who is also a member of the EB, was asked if senior management participated in the SCM process. The participation of senior management is limited to offer advice only on strategic aspects of carbon management and they do not have a role in its implementation. The Director of Estates said that he and the PVC, who sit on the SDTF, ensure that carbon management is taken seriously at senior level.

> *"I think it has got huge importance symbolically and practically. It means that we as an institution are behaving responsibly and ethically in terms of contributing to society which is going to be pollutable for future generations. So, that's what it means for us as well as the benefits here and now"* [Deputy Vice Chancellor]

The DVC agreed that senior management have a broader understanding of carbon management, but some of the technical aspects of sustainability and carbon management are overly complex for them to fully understand. The PVC was of the same opinion and the Director of Finance supported the argument of the DVC and added that carbon management is not just about saving money, it's the 'right thing to do'. He added that carbon management has several broader aspects to it but "money can be used as a driver to create change within the organisation".

7.6.2. Engagement of senior management

This theme investigates the extent to which senior management is committed to the SCM process at DMU. It was observed that active participation in carbon management is primarily from members of the environment team in the estates department and they are active members of the SDTF. The PVC argued that senior management has bought in, but practically it is managed through the SDTF. The PVC chaired the SDTF meetings, but the responsibility was later given to the Director of Sustainable Development suggesting that carbon management was deemed less of a priority within DMU. The former Chair of the task force, the PVC, was asked about his role in the EB and on the SDTF and to reflect on the commitment of senior management at DMU to reduce carbon emissions.

[13] 'B' is also a senior manager who is part of the EB and is kept anonymous.

> *"I used to chair the SDTF, but I think actually the Director of Sustainable Development should do that because he is the Director of Sustainable Development. But, I think me being on the SDTF is really an important bridge to EB. I think in the past the communication between the SDTF and EB have not been very good. EB is full of the directors and they are quite busy people, so they need to be getting clear messages that are very concise and backed up by data. I think in the past, we have not been very good at that generally, particularly in sustainability"* [Pro Vice Chancellor]

The above quotation from the PVC offers his opinion regarding the Director of Sustainable Development taking a lead on carbon management and chairing the task force However, the Director of Sustainable Development is not a member of the EB and this may prove problematic in delivering a clear message to the EB regarding carbon management initiatives. Previously, the Director of Sustainable Development had to request the PVC to take the environmental policy and performance report 2014 for executive approval as oppose to this happening automatically. This suggests that the importance carbon management has been lowered in DMU's organisational hierarchy. As the Director of Sustainable Development does not sit in the EB and this disconnection between the EB and the SDTF has weakened carbon management. The PVC also stated that historically communication between the SDTF and EB was not good and reiterated that the Director of Sustainable Development needs to ensure communication with the EB is clear and concise and backed by data and this is likely to prove a challenge. The DVC argued that the senior management is committed to carbon management and implementation of policies is indicative of their commitment.

> *"I suspect every university feels obliged to have a green policy, what I think might be different about us is that the policy is monitored carefully and implemented thoroughly by people who know what they are doing, by professional people in both estates and in other areas of the university like procurement"* [Deputy Vice Chancellor]

However, this is not the case and implementation of carbon relevant policies by the procurement team has not occurred. In fact, there appears to be a lack of expertise in some areas. The DVC was also asked about the significance of having a top-down approach to carbon management. He indicated his support of this strategy and used the term 'embedded' when describing effective carbon management via the curriculum at DMU.

> *This word 'embedded' is a good word, because it's easy to have things loosely attached. This is embedded in the syllabus and the EB. It's not something that is peripheral, it is embedded"* [Deputy Vice Chancellor]

It is interesting that the DVC responded suggesting the word 'embedded'. The case study evidence and informal discussion with a member of the Green Academy's Education for Sustainable Development (ESD) project suggested that carbon management is not embedded into the curriculum. In contrast, embedding ESD in the curriculum is one of the strategic principles in the University Learning, Teaching and Assessment Strategy (ULTAS). Furthermore, in regards to senior management engagement, the analysis of the minutes of meetings of the Board of Governors between

May 2014 to May 2015 indicated that neither sustainability nor carbon management was part of the discussions. After further inquiry with DMU's Executive Officer (the VC's Office), it was revealed that the EB had only briefly discussed carbon management, before receiving the annual environment report and the approval request for scope 3 target, indicating a less than committed approach to carbon management and sustainability at senior management level in DMU. This also contradicts the DVC's insistence that carbon management is embedded in the EB and reflects 'lip service'. In the SDTF meetings, discussion was more on staff and student engagement rather than senior management engagement. The DVC responded to the query on engagement of senior management, and argued that senior management are involved and participate in various forums where carbon management is discussed. The DVC was asked if the senior management are resistant to SCM and he replied that it was an issue with some academics but for the majority of more recently appointed academics they are more aware of it (see Table 62).

Researcher: Do you think that senior managers, who are traditionally academics, are resistant to carbon management? How do you see it? **Deputy Vice Chancellor:** I think that's an issue with some academics. I have been asked appointing academics all the time sitting on panels. I think that is less of the case; I think academics now appointed are more aware of it. Ten years ago, if I had to appoint an academic in English or history, that would be their world. Now there is greater awareness of context as well as subject. I think the green agenda is part of the context, is this university a university of ethical values? What are those values? Those questions are asked these days, they never used to be, but they are now. So, I think even some traditional academics perhaps haven't bought into it, but the vast majority of new intake are very focused on such issues, very focused indeed.

Table 62: Interview extract demonstrating senior management leadership/role of academics

The DVC explained that some of the senior managers, who are also academics, are resistant to change. However, a new generation of academics is aware of the green agenda, who are more likely to be engaged senior managers in future. The Director of Finance explained his experience of the EB and stated that carbon management is important for the university and is seen as a strategic issue.

> *"The fact that we put in our strategic plan is a fact that we want it. We see this as a fundamental issue. The fact that it's in that plan, it's important to the university"* [Director of Finance]

However, the reality could not be more different. While excerpts from interviews indicate support from DMU's senior management, DMU's 2015-20 Strategic Framework does not mention environmental sustainability or carbon management suggesting a shift of strategic priorities (DMU, 2016). The Director of Finance added that embedding carbon management is a time consuming process and the university has been dealing with competing priorities. He identified strategic issues such as recruitment and retention, student experience and financial sustainability and argued that DMU has to balance these issues. He added that carbon reduction was on the strategic agenda (according to the precious strategic plan) and DMU needed to implement it within its operations. This was proving to be a challenge for the university. In order to gain the middle management's

perspective on leadership, the Energy Manager was asked about the approach and level of senior management engagement.

Researcher: How do you see senior management's approach and understanding of carbon management? **Energy Manager:** Senior managers have to meet the CRC requirements. They are responsible for signing the CRC. The estates director is in charge of it. He has to make sure that the cost is given to us through energy savings. As I say it is reputation and the other thing is we have to meet the carbon management plan, which is HEFCE's requirement for carbon reduction based on 2005 baseline. So, that's a requirement, we have to meet that. **Researcher:** Do you feel that senior managers are concerned? **Energy Manager:** Yes, absolutely. Environmental group of directors are very keen on that. It is the SDTF. They have to make sure that we comply with projects and things like that, that meet the carbon management plan's requirements.

Table 63: Interview extract demonstrating senior management commitment

Feedback indicated that both senior and middle managers agree on the level of leadership from senior management regarding carbon management. The Energy Manager believes that senior management is committed because of CRC and HEFCE policies and because it has a reputation to maintain as a leader in sustainable development. This aligns with the DMU survey findings that the majority of the respondents/staff in middle management think that senior management is committed to carbon management. However, as the majority of the funding now comes from student fees, and no longer from HEFCE, this has weakened HEFCE driver for tackling carbon emissions. There is now less incentive to drive carbon management initiatives. The DVC argued that the university needs champions for carbon management. The Director of Estates is a champion at DMU and is part of the EB and pushes the agenda. However, this is not a formal role.

> *"Sometimes you need people who are champions for the cause. People who really want to push it and that can be very helpful in the EB. No doubt, our Director of Estates is on the EB. He is very keen on green issues, always pushing the green agenda. So, we do always have a voice in executive thinking. Indeed, it has probably got a voice of most people, but he will be the champion of the cause"* [Deputy Vice Chancellor]

There is no clarity regarding who should lead/be the champion for carbon management at DMU. The DVC stated that the Director of Estates is the champion, whereas the PVC stated that the Director of Sustainable Development should take lead on this agenda. During an informal discussion, the 'A' argued that DMU does not have committed leadership and yet the university has a Director of Sustainable Development. These three conflicting opinions further highlight the confusion and lack of coherence that exists at DMU within senior and middle management.

> *"We need committed leadership to drive it forward and we don't have that at DMU"* [A]

Table 64 presents an interview extract demonstrating senior management commitment. An Environmental and Sustainability Officer responds on the senior management's commitment and ways to improve it. He thinks that senior management is fully committed because they have signed the CMP and have agreed upon the carbon reduction targets. However, all of the projects that would

help meet the targets have not secured the funding yet. It can be inferred that signing the CMP does not reflect full support of senior management. As far as enhancing the commitment is concerned, the Environmental and Sustainability Officer is planning for better engagement with senior management.

Researcher: Do you think DMU's senior management is motivated and committed to carbon management? **Environmental and Sustainability Officer:** I think there is support for it; yes they have signed up to it and up to the carbon reduction targets as well. **Researcher:** Do you think DMU's senior management is fully committed at a strategic level? **Environmental and Sustainability Officer:** They are fully committed in terms of green carbon reduction targets, the carbon management plan lists the projects which we are going to implement to reach these targets, but not all of the projects in carbon management plans have had funding agreed to them yet, so there is still the elements that some of the projects will have to have funding found in order to deliver them. **Researcher:** What can be done to improve the top level support in the university? **Environmental and Sustainability Officer:** I think probably, perhaps, it's sort of better engagement with senior management and also with senior decision-makers. **Researcher:** Are you doing anything for that to engage senior management? **Environmental and Sustainability Officer:** Starting to, starting to, so I mean we are talking about setting some scope 3 targets, part of that is talking to senior management people.

Table 64: Interview extract demonstrating senior management commitment

7.6.3. Corporate strategy

Effective leadership from senior management can embed SCM throughout the institution with the help of corporate strategy. This theme explores integration of carbon management into corporate strategy and assesses if DMU has adopted a strategic approach to carbon management. The 2015-2020 strategic framework, includes guidance for the university as its endeavours to expand and develop its curriculum, broaden its catalogue of research while at the same time recruit new students through to 2020. This newly developed strategic framework however does not consider carbon management or environmental sustainability to be part of the strategic plan. However, the previous strategic plan of 2011-15 supported carbon management related policies and strategies because DMU had a vision of achieving environmental sustainability.

> *"Make a significant contribution to global efforts to achieve environmental sustainability"* [DMU Strategic Plan 2011-15, p.4].

The above quotation reflects that environmental sustainability and carbon management were one of the strategic themes until 2015. This omission of sustainability as part of DMUs future plans may not have a positive impact on the agenda and may discourage environmental managers. This is evident in the survey findings where the majority of the DMU respondents (seven out of the eight) stated that environmental sustainability is integrated into DMU's strategic plan. However, the strategic plan 2011-15 was revised via the help of a consultation process through events and workshops. The Researcher attended two of the consultation events to observe how carbon management and environmental sustainability are included in strategic discussions. They were not explicitly mentioned at any of the workshops and were not included in the seven key themes identified in previous

consultation workshops. However, financial sustainability was discussed. The new Strategic Framework 2015-20 was published in 2015 and does not include carbon management. Instead the student experience, global societal and economic development, city partnerships, global reach and influence and recruitment and retention are key strategic themes in the new framework as they are considered core business.

Four senior managers discussed various aspects of corporate strategy and carbon management. In Section 7.6.2, the PVC stated that carbon management has now become a much more strategic issue as a result of the HEFCE and national policies. HEFCE (2010b) also argues that carbon management is a key strategic issue for universities. The People and Planet's UL has also strategic importance due to reputational reasons and the university aims to achieve a higher position in the UL. This may put carbon management at a higher level in the corporate strategy. However, changes in the funding regime and shifts in corporate strategy are likely to affect carbon management, as these were previously the main drivers for effective carbon management. Based on the previous strategy, the DVC was of the view that carbon management is strategically important, similar to other strategic elements.

> *"It is a strategic concern; I mean clearly in an institution like this has a whole number of strategic concerns. Getting high quality students in, having a good research agenda. But I wouldn't want anybody to think that the green agenda has been pushed to the margins. It's not been pushed to the margins. It remains very much centre stage here in terms of our policy making"* [Deputy Vice Chancellor]

Again, the argument presented by the DVC does not align with many of the university policies particularly the Strategic Framework 2015-20. The university appears to be more focused on the core business of teaching and research. In contrast, he argued that it is impossible to separate carbon management from the core business. The core business is carried out within an organisation that has an ethical framework with green policies and carbon management being a core part of it.

> *"I think it is integral to what we are about and I wouldn't want to separate it out as something that would separate from what we are about. Yes, the core business is students, but as you said with the survey, the students are keen in this area. So, for the core business to ignore this area would be naïve to a great extent"* [Deputy Vice Chancellor]

At the time of analysis, the new framework was not published. The DVC argued that carbon management is integral to the core business and the university does not separate it. According to the NUS-HEA survey, students now want sustainability (Drayson et al., 2012), that's why carbon management has become more relevant. It is considered important for finance and others departments within the university; but it can have a higher profile in DMU, as mentioned by the Director of Finance. He was of the view that there seem to be knowledge on this subject within the estates directorate. However, this knowledge needs to be broadened within the whole organisation. Three of

the interviewees mentioned the role of business case in SCM. The business case of the projects is evaluated on a case by case basis against both financial and non-financial basis. The Director of Finance agreed that there is a business case for carbon management projects. He was asked if the university should prioritise and invest more on projects so that it gives value for money, profit and reputation. He argued that investment should be on both financial and non-financial basis. The Director of Finance reflected on the top level view and business case of carbon management.

Researcher: What do you say about the top level view of what DMU wants to do in terms of sustainability (carbon management), because you sit in the EB?
Director of Finance: It is becoming more and more important. I think it is a key driver, as I was reflecting on the fact that knowledge is not about what the executive team does, of course it is important, but it is equally important how that knowledge is shared throughout the institution. Because the first port of call is expertise, normally you will have the technical expertise in certain areas that understand the guidance fully, what that means, what different forms of energy potentials there are, what you want to do, share and embed knowledge within institution. That's the most important thing to do, actually equally the executive level as well, because executive teams are not expert abut carbon reduction. But, it is very important that knowledge is shared at executive and other levels to get the best results.
Researcher: Do you think investment in carbon reduction projects creates a business opportunity and it has a business case?
Director of Finance: Yes, absolutely. This will depend on the positive business case being presented, but we have seen a good example of that recently. So, it can do, absolutely, you can present a case that makes sense for financial and non-financial reasons. Sometimes, you need to do things by the way that doesn't enhance your financial position. Sometimes, you invest even though you don't want to, just to prove it's the right thing to do. Hopefully, you will get improved financial and non-financial position.

Table 65: Interview extract demonstrating top level view and business case

The Director of Finance argued that carbon management related knowledge is not shared widely. He stated that there is a lack of knowledge at the executive level and knowledge sharing can be effective. He believes that carbon management has a business case based on financial and non-financial basis. The Environmental and Sustainability Officer was contacted via an email to explore this further and take his perspective. He responded that although sustainability was not mentioned in the mission and vision statements, many areas discussed are linked to sustainability with different names, such as social responsibility and public good. The Environmental and Sustainability Officer argued to rebrand environmental sustainability and carbon management to align with the strategic plan. The university can support carbon management initiatives if they are linked to social and economic benefits, which came across strongly during the discussions. It was evident that economic sustainability has a preference and it emerged as one of the main themes. Therefore, when the new strategic framework 2015-2020 was published, carbon management and sustainability were removed from it. The Environmental and Sustainability Officer was contacted to take his view and his response is illustrated below. He was asked if this is as a result of change in HE funding regime.

If you look through the new framework, it does quickly become clear that the framework has no mention of sustainability or sustainable development. It also makes no mention of issues such as resource use, climate change or sustainable procurement. However, the framework is extremely strong on social issues and economic issues which are often the two pillars of sustainability that are overlooked. There is also mention of civic responsibility and global citizenship which in my mind is inter-changeable terms with sustainable development. There is also a strong link with the city in terms of 'promoting and improving our city', so this puts us in a good position with our work with the Environmental Experts Group and partnership working with Leicester as a low carbon city. So while it is disappointing that environmental sustainability doesn't feature in the framework there is still a sense that sustainability and in particular social and economic sustainability feature throughout the framework. So while it isn't explicitly mentioned in the paper there are strong elements of wider sustainability without it actually being named. I don't think this is a reflection of the change to the funding regime of HEFCE and private student funding, but perhaps more of a shift of focus within DMU to look at social and economic issues. Just because something isn't within the Strategic Framework, it doesn't mean that we shouldn't or won't do it. We have a mandate from HEFCE and a public commitment to reducing our carbon emissions which in my mind contributes to the wider public good.

Table 66: Extract of an email from the Environmental and Sustainability Officer [Dated: 04/11/2015]

7.6.4. Strategic conflicts

The journey to carbon management may create conflicts in the university. Strategic conflicts or tensions between carbon management and core business activities emerged as one of the main issues universities are facing. The issue of strategic conflicts was explored during the five interviews. Four of the interviewees (three senior managers and one middle manager) stated that there are conflicts between carbon management and core business activities within DMU. This is an issue for implementing SCM. As far as managing the balance between carbon management and core business activities is concerned, the survey findings reported that three respondents 'agree' and four 'neither agree nor disagree' that DMU is able to manage conflicts between carbon management and core business and subsequent growth. Four interviewees presented different strategies to manage the balance between carbon management and potential conflicts. The PVC was asked what senior managers can do to reduce the tensions, such as international travel and business travel.

> *"We need to be very clear about the benefits we get from travelling. We are not flying half way through the world emitting carbon as we go and then not giving any benefits back to the university. So, all the travel that we do is specifically focused on recruiting students and doing research projects. So we need to be very clear about the benefits we bring back to DMU. Then those benefits let's say the money coming back to DMU, and then we can invest some of the money into university's carbon management plan. So, that would be the ideal situation. The bottom line is as a university we got to be a viable business"* [Pro Vice Chancellor]

The PVC argued that the international business travel is important for the business and its success because international travel helps bring students and enhances the financial sustainability of the university. Then, the university can invest in carbon management. Despite the fact that travelling causes emissions, but the benefits it brings outweigh emissions. This quote reflects that the university

prefers the core business than carbon emissions in its quest to be a viable business. The PVC added that as relationship building has to be done face-to-face, so business travel is necessary.

> *"International travel is necessary, but it brings in money to the university which is income to the university and I think we should be using some of the income to drive down our carbon footprint in other way to offset"* [Pro Vice Chancellor]

The PVC suggested that DMU should use the money to reduce emissions as part of offsetting strategy. DMU's internationalisation strategy and carbon management creates conflicts. The Director of Estates supports recruiting international travel based on the benefits they bring to the university. He argued that foreign students are the biggest market for DMU. DMU's internationalisation strategy aimed to double overseas students (non-EU) intake from 2009/10 levels by 2013/14 and beyond. The strategic plan 2011-15 had a specific theme on internationalisation stating *"we will be a truly international university, building influential global relationships to enrich our research, teaching and cultural collaborations"* (DMU, 2011a, p.25). Internationalisation will result in staff and students' international travel. The Strategic Framework 2015-20 also aims to develop, promote and publicise DMU's international profile and increase recruitment of international students (DMU, 2016). This has carbon implications, which appears to be in contradiction with carbon management agenda and is not considered in strategies and plans.

There are initiatives which require international travel. DMUglobal is an initiative to provide work experience and study-related opportunities for participating students around the world. The project reflects DMU's international outlook and aims to boost employability and provide student experience. DMUglobal was first presented in the SDTF meeting held in February 2014 by one of the members. The members discussed how to ensure that this initiative aligns with DMU's carbon management principles. In June 2015 SDTF meeting, members discussed that the international agenda is recognised as increasing the university's emissions; therefore, other areas would need to decrease emissions to offset. This is a challenge and currently, there is no strategy to address this. However, because of international outreach, the contribution of air travel to the total carbon footprint is small at approximately 10%.

Core business and carbon management

This section investigates the position of carbon management as compared to core business. Four interviewees (all senior managers) stated that carbon management does not have priority over the core business activities. Core business is preferred in DMU and this could be the reason that there is a lack of focus on embedding carbon management in the organisational management. The PVC was asked where carbon management stands as compared to the core business. According to the PVC, carbon management is not prioritised and it has secondary priority, but it is an important factor for the

university. DMU needs to focus on core business and financial sustainability as university is a sustainable business due to these two factors and this is the top priority for the executives.

> *"The pragmatic answer is that it has to be secondary because if you don't have your core business, then you don't have a university. It is one of the things that come as a secondary factor, but an important factor. The thing that drives the executives most is to make sure the university is financially sustainable because if it is not financially sustainable, then it won't be a university and everything else becomes irrelevant. So number one priority is to make sure the university is financially sustainable"* [Pro Vice Chancellor]

The Director of Estates stated that the core business has priority over carbon management in the EB. He added that success in its core business can result in a sustainable university. However, sustainability (environmental sustainability) is given importance.

> *"I am not going to say to you that carbon management is the highest priority in the EB. The highest priority of the EB is making the university successful. It is core business, which is education and students. The university has to do that because if the core business doesn't work then it makes no difference whether we are sustainable or not because we won't be here. So, core business is always a priority, but sustainability is always treated with utmost respect and given a lot of importance by the EB"* [Director of Estates]

Senior management is interested in financial sustainability as a matter of priority and the PVC quoted on the ideal situation for the university and successful carbon management. He was of the view that the university needs to recruit more students and research grants to generate income, so that this income can be spent on implementing the CMP. This could be a success for both the core business and carbon management addressing the principles of 'triple bottom line', which suggests that a university should be accountable for financial, environmental and social performance.

> *"My ideal situation is that we have a thriving university that has student recruitment and strong research that generates income for the university and part of that income can be used to deliver the carbon management plan. So that's my ideal situation, strong university, lots of income and we use some of that income to deliver carbon management plan"* [Pro Vice Chancellor]

The DVC argued that air travel costs DMU in terms of air miles and carbon emissions, but it broadens the horizons of students, makes them aware of the global issues and familiarises them with other cultures. The below quote reflects core business as a matter of priority.

> *"I wouldn't want to deprive students the experience of working abroad simply because of the carbon issue. There could be other issues to do with safety and so on, that come into play. There are issues around students' safety and so on"* [Deputy Vice Chancellor]

The PVC believes that it is challenging to deal with contradictions (conflicts), but the university needs to grow its business and recognise carbon management. Lack of growth could be harmful for the university business.

> *"The solutions will come gradually. It's not an easy area, but yes, there are contradictions. There are lots of policies that have contradictions. If we don't move forward and make the university attractive, the university will seize to grow. If the university seizes to grow and develop, there will be one less university that puts centre stage the carbon debate. There are contradictions, but you need to face up to them"* [Deputy Vice Chancellor]

The university needs to run its business and deal with emissions innovatively. A member of the SDTF discussed the continuous increase of energy use due to campus expansion plans and the increased international agenda in the SDTF meeting held in June 2015. As members of the EB discussed a lack of priority to carbon management due to student recruitment and experience, but the Energy Manager contradicted some of the issues related to student experience. He argued that opening buildings and facilities 24/7 is not a good student experience and the university needs to define the 'student experience'. The problem is that the Energy Manager is a middle manager and is not part of the decision-making and management process, so he does not have contribution in the strategic process. There could be a difference in thinking of senior and middle managers.

> *"I don't understand what the good experience means. What I see, if only two people in the IESD need to use room, then why should I be heating the whole Queens building? Why should I be lighting it? But, I haven't got control over it. This comes from higher level. Good experience is 24/7 building, library 24/7. I asked library people, how many people are using library after 9 o'clock or 10 o' clock. I didn't get any response. To me, as an energy manager, this is total waste of energy, but, I haven't got any say in it"* [Energy Manager]

This quote reflects disconnect between the EB and middle management in the estates. Senior management aims to provide more an out of hour's facilities to students to enhance student experience, but the Energy Manager believes that there is no need to open all the facilities.

7.6.5. Strategic decision-making

This theme explores how understanding and perception of senior management leadership is translated into strategic decision-making and management. When it comes to senior management leadership, strategic decision-making is a key to their role within the university. This sub-theme explores to what extent carbon management is considered and integrated into the strategic decision-making process at DMU. Three members of the EB were asked about this issue in the second phase of the research and the analysis illustrates that carbon management is an afterthought in strategic decision-making and management. Two interviewees seem to believe that it is not effectively integrated, but the DVC said it is considered in decisions, but more can be done on this. However, a lot of decisions the university makes are based on student experience and employability, which is good for the business. This is evident from the new strategic framework and the SDTF meetings. This reflects the university's priority to the business success. DMU introduced a strategic initiative, DMUglobal, and the following quote reflects if carbon management was considered in decisions or not.

"DMUglobal is a key recruitment tool for us, which will bring money to the university and we could recycle some of that to offset additional travel which is happening as part of DMUglobal. That detailed level has not been thought through yet and the SDTF is for that" [Pro Vice Chancellor]

The PVC argued that carbon management was not considered into decision-making:

Researcher: Is carbon management or widely environmental sustainability considered into strategic decision-making? **Pro Vice Chancellor:** Yes, it will be at some stage. It may not be at the very early stage, but it will be considered at some stage. DMUglobal is a good example. When we had the very first discussions about DMUglobal, we did not talk about carbon management and its carbon impact initially, but later on, before it was implemented, it was talked about.

Table 67: Interview extract demonstrating carbon management into decision-making

The PVC said that this is similar to equality and diversity, as everything the university does is based on an equality impact assessment. This is not done in the start, but this is done at a later stage during the implementation. The PVC explained that strategic decisions are made by the EB. When the EB discusses projects to be implemented, the carbon impact is not discussed as they do not have quantitative data as evidence. Thus, carbon management is considered in the detailed delivery stage, but, then the project or policy cannot be reversed. For example, DMUglobal has a significant carbon impact and this was not considered when decisions were made and currently it is in implementation. Now, the estates department is trying to minimise the emissions by offsetting and reducing emissions in other areas. The survey results indicate that it is not clearly established if carbon management is central to business activities and strategic decision-making as dispersed results were obtained (three respondents 'disagree', two 'neither agree nor disagree' and three 'agree') (see Section 5.6.3).

Another example of strategic decision making is the implementation of district heating scheme in Leicester. This project was identified in the CMP and DMU was keen to implement it. This was not implemented because of mistrust on the business case between DMU and the service provider. Both parties did not come to an agreement on facts and figures of the proposed business case, as there was no payback and it required heavy investment. DMU decided not to go ahead with that service provider. Furthermore, organisations that already have this scheme were contacted and some issues were found such as insufficient heat supply and more heat was being used than actual calculations as they underestimated the heating required. Thus, DMU decided that it is not a viable business option. This example reflects that financial return is an important element which is considered in decision-making in addition to carbon management. This suggests that strong business case is necessary for strategic approval. The DVC was of the view that even if you give higher priority to the green agenda, there is always more the university can do.

> *"Whatever priorities you give to green agenda, there is more that could be done and we are not going to be bottomless pit, but I would want to emphasise that this is not a bolt on policy, this is a central policy"* [Deputy Vice Chancellor]

The DVC stated that carbon management was discussed while debating DMUglobal in the EB. During an interview, the Head of IT Operations, who is a member of the SDTF, stated that it is a disappointment that the university did not implement the district heating scheme, as planned in the CMP. He was of the view that the Director and the Deputy Director of Estates wanted to join the city-wide heating network, but it seems that funding was not allocated. In contrast, the Director of Estates argued that the business case was not correct, as stated above in this section. DMU's energy policy states that connection to the city wide district heating and/or power network scheme will be assessed for viability (DMU, 2012), but it did not go as planned suggesting a mismatch between policy and practice.

> *"The district heating system disappoints me that we cannot move forward and actually it frustrates the Director and the Deputy Director of Estates as well, because they see the benefits of it, because everybody seems to be doing that and we should do that as well. I don't know why? But, they have moved on enormous amount and they have done lot of good work"* [Head of IT Operations]

In addition, the researcher joined a live chat with the VC and the President DSU for Q&A session. Table 68 presents the researcher's question and the VC's answer in the chat.

Researcher: How DMU is responding to the challenge of increasing carbon emissions (and climate change) in its strategic management and decision-making process? Also, where it stands in terms of its core business activities? **Vice Chancellor:** Our Strategic Plan focuses specifically on this. Our new campus transformation will be employing the very latest in carbon reduction technologies and you will already see the new solar panels that we have installed around the campus. Our Director of Estates can tell you more. We are also keen to get your ideas as a PhD student of IESD. Obviously, this is crucial to our core financial sustainability as well as our institutional commitment to the public good.

Table 68: The VC's perspective on SCM

The VC stated that the strategic plan focuses on carbon management. In contrast, the strategic framework 2015-20 does not consider it as one of the strategic themes. The VC believes that carbon management is core to DMU's financial sustainability and commitment to public good. This reflects that the university is more focused on financial sustainability, as concluded from the strategic framework consultations. The public good agenda is important for the university, which, according to the Environmental and Sustainability Officer, is indirectly linked to the sustainability and carbon management agenda because public good in its widest context can include action on climate change. However, public good predominantly demonstrates social aspects and may not involve carbon management.

7.7. Funding and resources

Funding and resources emerged as one of the critical factors required for implementing SCM (Section 5.7 and 6.5). This theme explores if there are funding and resources available for implementing SCM at DMU. The survey showed that there are varying opinions on the provision of financial and managerial resources within DMU. Some of the managers believe that the university has provided resources for projects; whereas others argue that there is a lack of funding and resources. This illustrates that the financial situation is not ideal in regard to implementing projects. Furthermore, five interviewees discussed funding required for SCM. Four of the interviewees were members of the EB, who are involved in the strategic decision-making process. This provided an opportunity to discuss funding issues with senior managers rather than middle managers in the estates department. The funding issue was discussed with the PVC, DVC, the Director of Estates and the Director of Finance. DMU is investing money in carbon management, but it needs more financial investment, as some of the projects are not implemented. Looking at other universities, there is often a pot of money for carbon reduction projects which can be drawn upon for specific projects. At DMU, these projects are treated on a case by case basis and larger projects are funded centrally e.g. the Photovoltaic (PV) panels on various buildings. This may delay the implementation of projects. However, the business case must be there for any project. Carbon management projects cost money and a financially sustainable university can invest in projects. This is the first year when the Environmental and Sustainability Officer received a separate budget, which is a step forward. The PVC argued that the EB needs to see a clear plan for future investment decisions because the university needs to invest more in projects. This shows that the senior management recognise financial implications of carbon management. However, carbon management projects need business case for approval and a financially sustainable university is likely to spend more keeping in view the business advantages.

> *"Some of these things cost money. You cannot do it for no cost. That's why; I say my ideal situation is a healthy university where we use some of the income to focus on delivering the carbon management plan. We are already doing a bit of that through the budget that is given to the Environmental and Sustainability Officer, but I would like to do more. But, I am going to have to justify and argue that with the university. So, I will be going to EB and saying this is our carbon management plan; this is what we want to deliver. We need to invest in this as a university and we need some more funding"* [Pro Vice Chancellor]

According to the PVC, finance is a barrier and this was found in Section 6.5 in Chapter 6. It appears that strategically, carbon management is not considered in decision-making processes. As stated above, financial situation of the university plays an important role into strategic decision-making because carbon management can be cost intensive and this can be problematic.

> *"Finance is a bit of a barrier because these things cost money and you got to be able to persuade EB that it is worth investing in. If you say to EB, we can either do in this way or this way, it delivers the same but one of them cost 10% more but saves 20% carbon. That's an interesting decision for EB to make because depending on the financial health of the university. If they are purely driven by finances, they will choose the one that increases carbon and reduces cost and if the university is in a very strong financial position, they are much more likely to say we can afford little bit more if it reduces our carbon footprint. So the financial health of the university is critical to decisions that we make related to carbon. So, money is an important barrier"* [Pro Vice Chancellor]

For example, the Leicester City Council (LCC) has a policy target of 18% renewable energy from any new development. Fletcher development at DMU is aimed at producing total 13% energy and taking 5% from the Hugh Aston and the Gateway house renewable energy to make it 18%. According to the estates managers, this was agreed with the LCC. Cost could be a main barrier here. However, the Mechanical Building Services Engineer at the consultant organisation argued that there are technical issues associated with the building such as there is not much roof space and location of the site is also a problem and the design is more focused on passive solutions. The policy of the LCC is ambitious and it is hard to meet this target. The Director of Estates stated that sustainability and carbon management need significant capital cost, but operational cost will be less and this can be beneficial.

> *"Although, when you look at the life-long costs, sustainability is not particularly expensive. When you look at the initial cost, I find it generally expensive"* [Director of Estates]

The Director of Estates agreed with the PVC and said that there are issues in terms of finance which is required to implement projects. However, this is not a major problem, because the university arranges money through various sources to invest in projects which give financial and carbon return. However, more financial resources could help the university.

> *"We could always do with more time and we could always do with more resources, but, I don't really think that time and resources are huge barriers to sustainability. I am not saying it doesn't affect it, but I don't think they are a huge barrier"* [Director of Estates]

In contrast, the DVC argued that sometimes, carbon management is pushed away due to cost involved. This is one of the barriers. This suggests that carbon management does not have higher profile in decision-making. The Director of Finance was asked if finance is a barrier. He responded that finance should not be a barrier, but the barrier can be inability to present the business case both on financial and non-financial basis. This suggests that a strong business case is able to secure money for the proposed project, which complements the PVC's argument above. The Director of Finance admitted that there are competing priorities, but the university needs clarity where carbon management stands.

"I don't think finance is a barrier. I think probably the barrier is actually being able to present business case that has adherence that shows financial and non-financial benefits. Of course, you are going to have competing demands of money. One of the challenges is, how you prioritise investment, so that goes back to the point where do you prioritise carbon reduction, where is that in terms of national, local or university agenda" [Director of Finance]

7.7.1. Sources of funding

DMU has different types of budgets. The Director of Estates explained that each year, estates department has three budgets. First is the 'revenue budget' to pay staff in the department and operation and maintenance of buildings. Second is the 'capital budget' which pays for new installations such as putting new windows etc. Third is the 'special projects budget' for new buildings. The normal day-to-day running of the estates is paid from the revenue and capital budgets, but any special project is paid centrally from the university. According to the Director of Finance, Operating Expenditure (Opex) is the money that the university provides to spend on a day-to-day basis to educate and provide student services, cost of staff, and cost of course consumables and materials, energy and running costs of buildings. Capital Expenditure (Capex) is capital cost or major investment cost. DMU has a threshold of anything over £10,000 is Capex. For example, cost of a building, refurbishment and purchase of IT equipment. The criteria to spend money are payback period, energy and carbon savings. Longer payback period can be an issue in some projects, as 'A' in an informal discussion argued that the university ask for payback period of 3 years for any investment and environmental projects have longer payback and this is an issue for us.

DMU is using multiple sources of funding for implementing projects. DMU received two funding streams from the Salix Finance Ltd to implement projects. In February 2011, a total of £69,060 were spent which include £43,860 on gas boiler load management and £ 25,200 on LED lighting changes. DMU also received £21,762 to be spent including £14,405 for LED tubes changes and £7,357 for external LED flood lights replacement. However, Salix funding has been limited and the university aims to apply for more, as discussed with the Energy Manager. In addition, DMU allocates budget equal to 3% of the annual energy and water budget to an energy efficiency budget, which is spent on energy and water reduction measures in buildings. The Energy Manager controls this budget and as such is responsible for developing appropriate interventions based on payback and the chosen technology (DMU, 2012). In October 2013 SDTF meeting, the Director of Estates reported that estates had been successful in obtaining a sustainability specific budget for the Environmental and Sustainability Officer. This was the first year that this had happened and is a step forward in the university's carbon management. This budget is mainly for non-technical projects. The projects such as PV panels and buildings are funded by the university with the EB's approval, but the budget

streams appear to be limited. AUDE (2014) unpick that universities are increasingly relying on the internal funds to invest in projects.

Impact of change in funding regime

There has been re-organisation and re-structure of DMU in last four to five years and cost cutting was carried out to invest in the core business. The Director of Finance is concerned with the increasing energy prices and spends. The DVC argued that overall the financial situation is tight in the university sector, particularly after the change in funding system. HEFCE (2011) reported that the current financial environment is likely to bring challenges for universities. This was complemented by the Director of Finance who argued that the government provided nearly 80% of finance to universities in the past, but now, students' tuition fees provide around 80% of the income. Therefore, students are the main source of income. This has made HE a more competitive market as there are many universities in the UK trying to recruit students and there is no cap on the number of students being recruited. The Director of Finance suggested that the university needs to be careful in its spending keeping the green agenda as one of the top priorities in decision-making. The Director of Finance highlighted that the change in funding regime has impact on student experience and the university's approach to be more focused on student recruitment, retention and experience.

> *"Obviously, it's a fundamental change in terms of where funding is received from. Importantly, that funding can be received from home or EU students, but also international students. So, there is obviously a link though the loan council for the home and EU students. So, it's a really important change in terms of how income or funding is received. That's an important link to how you ensure or improve student experience to ensure that we can recruit and retain students and give them really good education and outcome"* [Director of Finance]

These changes have transformed the dynamics around student experience and individual expectations of students are higher now. This has made universities quite focused on the core business. The Director of Finance explained that the university invests on projects based on both financial and non-financial benefits. Student experience has received increasing attention in strategic decisions after the change in the funding system.

> *"Finance should be integrated into the organisation, but that re-emphasis the funding change, reemphasise finance to significantly understand that it helps improve student experience, how we invest money. It's really important that money is invested in a way it's not just about financial benefits, it's about the non-financial benefits. The non-financial drive is significantly important around enhancing the student experience"* [Director of Finance]

The Director of Finance argued that the university needs to provide good student experience within its budget and deliver value for money to students. In addition, the role of HEFCE was discussed to take his perspective. As HEFCE initially linked carbon management with capital funding, the Director of Finance argued that the HEFCE could do more by incentivising universities to implement projects

because there are no financial incentives. The influence of HEFCE is now weaker than before and the Director of Finance was of the view that HEFCE should use money to drive organisational behaviour towards implementing carbon management.

7.7.2. Human resources (HR)

HR is important, when it comes to resources required to implement SCM within the university (Section 5.7.2 and 6.5.1). The UL recognises human resources with a separate category on 'Human Resources for Sustainability'. The Director of POD was interviewed to explore if the POD considers carbon management into its HR strategy and POD operations. The Director was of the view that the department understands its significant environmental impact within the university, but carbon management is not part of the HR strategy. It is more indirect in terms of health and safety and wellbeing practices. The interviewee argued that sustainability is a brand new area and this is why carbon management is not part of it specifically. However, the department has implemented initiatives such as the staff engagement project, Green Impact. Upon enquiry, the Director of POD stated that as far as job descriptions are concerned, carbon management is not part of all job descriptions in recruitment process. It is a part of some university roles, for example, estates department related roles. It is also not a part of professional development and training programs in the university. This suggests that carbon management is not integrated into HR strategy. It seems that POD is not effectively engaged in the process.

> *In the last few weeks, the decision has been taken to add requirements for carbon management responsibilities to the templates for all job descriptions at DMU"* [Environmental and Sustainability Officer]

The above quotation only indicates discussion at a policy level and this is not implemented yet. Furthermore, estates personnel try to incorporate carbon management into staff training and development programmes and induction events. This occasional engagement may not be enough for effectively implementing carbon management. DMU is conducting staff survey and sustainability is a part of it in order to raise awareness and support staff engagement. Below is an extract of the interview with the Director of POD demonstrating how POD is responding to carbon management.

Researcher: How HR/POD is contributing to DMU's carbon management commitment? **Director of POD:** We have a people and organisational development plan and HR is a part of it. We can do simple things when we recruit. We can test and understand people's understanding of those issues. We have an expert team in estates and in your department to make sure that DMU is a better corporate player. We have health and safety strategy, which includes sustainability telling people to eat well and live well. Organisational development is all about making change for the university, getting people's ideas and thoughts together. Our role is about getting people's ideas and they train and understand in complex situation.

Table 69: Interview extract demonstrating the role of HR/POD into SCM

The above extract illustrates that POD can play a role in organisational change and can train and engage staff. Carbon management or environmental sustainability is not a requirement for staff

recruitment suggesting that carbon management is not a key part of wider job roles. The Director of Estates argued that the environment team is effective in implementing initiatives. However, the team is small in numbers, as other universities have larger number of team members. An informal discussion with the Environmental and Sustainability Officer at DMU pointed out that he is overburdened, as he is involved in various carbon reduction projects. The Director of Sustainable Development has the same view that there is a lack of HR in estates and one person is doing many jobs without any authority. The result is in line with HEFCE (2009a) that there is a deficit of skills in HE in terms of carbon management. The UL recognises this because DMU scored 40% out of possible 55%. Despite lack of HR, the Director of Estates quoted on the overall performance of the environment team.

> *"I think the energy team we have got here is brilliant. I really do think that. The whole sustainability team is absolutely brilliant, because they keep coming up with different initiatives and that sort of things"* [Director of Estates]

7.8. Stakeholder engagement

This theme explores the level of stakeholder engagement, mainly staff and students. Staff and student engagement is investigated based on the perceptions of the middle and senior managers working in different departments. DMU believes that staff and students have a key role to play in SCM process. The SDTF meetings and the interviews suggest that DMU is focused on staff and student engagement through various strategies, but it has not secured much success and a lot more needs to be done in this area. However, the environment team considers it an important area. DMU is not only implementing low carbon technologies to meet the targets, but also trying to engage staff and students through behaviour change.

> *"We are helping to turn words and targets into affordable technology, while changing the behavior of people and organisations"* [DMU, 2015a]

The Transport Co-ordinator, during an informal discussion, stated that the university needs both top-down and bottom-up approaches to low carbon travel and transport, as staff and students cannot be enforced. However, limited progress continues in encouraging staff and students to adopt environmentally friendly forms of commuting and reduce emissions.

7.8.1. Staff and student engagement

Staff and student engagement is a key issue universities are facing including DMU, as found in Section 5.11.1 and 6.8.1. Four interviewees discussed different aspects of staff and student engagement. DMU takes stakeholder engagement seriously and has been implementing various projects to engage staff and students. This theme has received much attention in the SDTF and other environmental meetings. However, there is a lack of staff and student engagement and this is evident

through the personal observations. The Learning and Development Adviser at DMU stated that *"staff do not care. Senior management do not send powerful message. They don't set an example and we need more senior management engagement at all levels".* This suggests that senior management leadership can influence staff engagement. Dahle and Neumayer (2001) describe students and staff as careless in regard to green agenda. The change in funding regime and increasing competition in HE has made students and university management more focused on student experience and income generation in a competitive HE market. Therefore, students aim to get more benefits out of their financial investment and it may lead to less focus on carbon management related activities during their stay in the university. However, the environment team is implementing two main staff and student engagement projects which include the Green Impact (GI) and the Student Switch Off. Departmental teams participate in the Green Impact and students volunteer as Project Assistant and Auditor. The environmental report 2013/14 suggests that staff engagement increased in the GI project. However, in 2014/15, the number of teams in the Green Impact project was reduced suggesting a lack of staff engagement in the university. The researcher being a volunteer noted that there is a lack of interest and participation from students. The Student Switch Off is implemented in two halls of residence and in 2014/15 and 2015/16; it also included Unite halls of residence. There are plans to expand this further. However, at present, this ignores student population in other halls of residence (both university owned and private) and on campus students who do not live in halls. Currently, there appears to be emphasis on staff engagement through Green Impact, but the Student Switch Off does not cover wider population of students. This is supported by A:

"There is emphasis on staff engagement, but I am not sure on student engagement" [A]

The university has set targets to deliver at least one behavioural change project per year in halls of residence for students and on campus for staff to 2016/17. This is not enough to embed SCM in the whole organisation and gain stakeholder engagement. There is no evidence and quantitative figures to demonstrate the impact of behaviour change and engagement projects, so it may be hard to develop evidence based engagement approaches. This could make the argument stronger and could help enhance staff and student engagement in the university.

In an informal discussion, the Vice President Welfare at DSU stated that there are roughly 20% students who want to contribute to environmental sustainability or carbon management at DMU, whereas others do not care about this agenda. During the Fairtrade Fortnight at DMU, a series of climate talks were conducted. There was no representation of students during the talks and little representation from staff. There were mainly estates staff and IESD staff and students. This suggests a lack of student engagement and the Environmental and Sustainability Officer agreed to it. DSU is trying to create a range of volunteering opportunities for students to get involved and enhance

engagement. The Vice President Welfare was of the view that by showing students their personal career benefits and for the improvement of their CV, the university can get them engaged. DMU is working on various initiatives, campaigns and volunteering projects, but the project related to carbon management are rare. This could demonstrate a lack of engagement of DSU. The DSU representative has not actively participated in SDTF meetings and there is not any programme to engage students, as DSU can have significant influence. DSU is more focused on recreational opportunities. According to the UL 2015, DMU do not have student representation on the university committees related to estates, planning, and finance and resource allocation. The Vice President Welfare argued that DSU does not have representative presence in the SDTF. She went on saying that she does not feel involved in the process at DMU because of limited time and knowledge in this area. According to the Vice President Welfare, there has been less engagement from students, but this is improving gradually.

DMU aims to enhance staff and student engagement through initiatives such as fresher's week, induction events, Square Mile, DSU events and Demon FM. Environment team attends the 'welcome weekend' event and other events during fresher's week. In addition, at various SDTF meetings, it was argued that there is potential for greater engagement with students through working closely with the SDTF and DSU, building on the existing initiatives to develop new approaches to engage with the student body. The email response of the DSU Welfare Officer on student engagement, its barriers and the role of DSU is presented.

Researcher: How do you see involvement of students in DMU's carbon management process or widely environmental sustainability initiatives? **Vice President Welfare:** Student engagement with DMU's environmental sustainability initiatives has improved over the past few years. One of the key contributions to this is a member of the DSU executive team (Vice President Welfare) sitting on the SDTF. However, this is not representative enough. Student involvement may be improving but it is still low. There is little drive from the students to be engaged with the process, and this can be for a number of reasons. **Researcher:** What are the barriers to student engagement? **Vice President Welfare:** Some students are unaware they can be involved with the process and without them searching for it there can be difficulty in engaging those interested. University communications with students is difficult as there is so much for students to be involved in throughout their University career. Another barrier is students balancing their studies with their extra-curricular activity, jobs, childcare etc. It is difficult to find the time to be involved. **Researcher:** What is DSU doing to increase student engagement in carbon management and environmental sustainability initiatives at DMU? **Vice President Welfare:** DSU has partnered with DMU to create frontrunner positions for the next academic year that looks at sustainability initiatives at DMU and ways to improve these and engage more students. The position also looks at the Green Impact accreditation scheme in both DSU and DMU. We are hoping that the aspect of this being a paid role will gain more interest. DSU have recently introduced the Green Project Fund, where students who wish to run their own green projects can bid for a part of the funding to help them achieve this, maximum of £250. **Researcher:** Do you feel involved in carbon management process at DMU? **Vice President Welfare:** Although I do attend the relevant committees, I don't feel heavily involved in the process. This is mainly down to my lack of knowledge on the subject and time restrictions.

Table 70: Email extract demonstrating student engagement and role of DSU [Dated: 12/05/2014]

It was observed in the SDTF meeting that the environment team is trying to liaise with the DSU to identify ways in which students can be encouraged to have greater participation in the carbon management process. However, the success has been limited. In contrast, the President at DSU demonstrated his commitment to improve sustainability.

> *"DSU is also committed to improving its sustainability. The Vice President Welfare is working hard on green initiatives throughout this year"* [President DSU]

The interviewees from the Marketing and Communications Directorate and the Information Technology and Media Service (ITMS) stated that staff have reasonable understanding of carbon management. According to the Head of IT Operations in the ITMS, understanding and engagement varies and everybody does not understand carbon management. The Senior Media Officer in the Marketing and Communications Directorate argued that staff understand the importance of carbon management, but they do not understand complexity around carbon management due to nature of this subject. The Senior Media Officer stated that the communication department is interested and is involved through the Green Impact project.

> *"They understand that it is important. However, lot of stuff is high level. We have done Green Impact scheme. We talk regularly with the Environmental and Sustainability Officer. We have fair understanding. We are pretty good as a department and are interested"* [Senior Media Officer]

The PVC argued that staff seem to understand the role of carbon management. Individuals trained in this field and having background knowledge in this subject area may have detailed understanding of carbon management related issues. In contrast, others may understand carbon management in broader terms. The Director of Finance was of the view that staff could be more concerned at a personal level only, but they do not pay energy bills, so this could be one of the reasons for a lack of staff engagement. The Head of IT Operations seems to believe that the Green Impact can play an important role to develop understanding among staff and enhance engagement. The Green Impact teams have only selected members working towards the accreditation and there appears to be a lack of wider engagement in departments. The number of team members appears to be less and they are mainly administrative and support staff, who keep faculties involved to some extent.

7.8.2. Engagement of academics

Academics are a big community in the university. The members of the SDTF noted lower rate of engagement from faculties and academic colleagues. The role of academics in the SCM process was explored during an interview with the PVC and he was of the view that academics are supportive and contributing to the process. They understand and are engaged through the SDTF membership, but the SDTF has a lack of wider representation of academics. The academics' engagement does not appear to be visible at the organisational level and they seem to work in silos. The PVC was of the view that

academics in DMU are supportive of carbon management, but everybody is not engaged. This was observed in the Green Impact project and the SDTF meetings as well. In general, the PVC believes that SDTF has been good for the engagement of faculties.

> *"I think they are genuinely supportive. They genuinely understand the issue and are supportive. I think that's a misconception. There might be small minority that are not supportive, but you get a small minority not supporting whatever initiative you take. I think our academics genuinely would be supportive of our carbon reduction and management plans. I think through the SDTF, engagement with the faculties has been quite good and I don't think there have been many barriers"* [Pro Vice Chancellor]

In contrast, the Head of IT Operations argued that there are no teams consisting of academics in the green Impact project at DMU and academics do not tend to participate in the Green Impact project. However, some of the academics aim to integrate sustainability into the curriculum, as discussed in a series of the SDTF meetings, but there is a lack of practical actions from them. Section 7.6.2 also reflects on the engagement of senior academics that are in the EB. Lack of engagement of academics can be due to their busy schedule and lack of time. Dahle and Neumayer (2001) are of the view that academics are uninterested in the greening process and busy with their academic work.

> *"I think there is buy in, buy-in in terms of all the faculties to get involved in the Green Impact and academic colleagues don't tend to. Some academic colleagues talk about teaching and building sustainability into the curriculum. I think that's important, but it needs practical will as well"* [Head of IT Operations]

7.9. Governance

This section details the governance arrangements and encompasses themes to implement carbon management strategies from an organisational perspective. Like other universities, DMU has a Chancellor and a Board of Governors. There are 15 members of the Board of Governors and the Chair of the board has a role in leading the Board. The Board of Governors has a responsibility for determining the academic character, mission and for general oversight of business activities. It approves the academic university's strategy, which supports and informs the setting of the strategic and other future priorities. The university has a VC who is the Chief Executive (Figure 31). The VC is accountable to the Board of Governors for the organisation, direction and management of the university. VC is supported by an Executive Board (EB), which plays a crucial role in developing and implementing the university's strategies and plans (DMU, 2015g). There are 14 members in the EB and it is chaired by the VC. The membership of the EB includes Pro Vice Chancellors (PVCs) and Executive Directors of departments, as in Figure 31.

As far as the governance of carbon management is concerned, the survey found that DMU has developed carbon management strategies where it has more direct influence and control such as energy use in buildings, transport fleet, waste, water and staff and student commuting. In contrast,

there are areas where DMU does not have effective carbon management strategies such as procurement and supply chain, international student travel, UK student travel, visitors' and business travel. DMU has less control of emissions from these activities because multiple stakeholders are involved. In the survey, there are different opinions on lack of focus on these areas of emissions, but, in general, the survey revealed that the majority of the DMU respondents believe that the university is effectively managing emissions. The university has policies in most areas of carbon management, but these policies are not popular among all of the stakeholders in the university and appear to be in isolation within the estates department due to its responsibility in developing and implementing the policies. The effective implementation of these policies and strategies could contribute to SCM process at a whole-organisation level.

> *"All policies are in place. The challenge is to implement them effectively"* [Director of Sustainable Development]

The main contribution towards SCM is from the estates department. Estates department provides an estate of optimum size, location, quality and condition. The estates is backed up by an estates service which supports the delivery of its core business, ensuring that staff and students operate in a working environment to enhance teaching, learning and research. The estates department is responsible for the management of energy, carbon, environmental issues, car parking, cleaning and security. Despite many efforts, the estates department seems to work in isolation, but the SDTF aims to develop cross-departmental collaboration and engagement, as discussed in Section 7.5.1. As far as the organisational structure is concerned, the majority of the survey respondents did not give their explicit opinion on the effectiveness of the current organisational structure of DMU for implementing carbon management strategies. Section 7.5 illustrates that the environment team within the estates department is working in isolation. There were diverse opinions including five respondents 'neither agree nor disagree', two 'agree' and one 'strongly agree'. There is no dedicated person for sustainable procurement and travel has only part time Travel Co-ordinator. The environment team in the estates department is relatively small consisting of two full-time (Environmental and Sustainability Officer and Energy Manager) and two part-time members (Energy Officer and Travel Co-ordinator). The issue of lack of HR was raised by the Director of Estates in Section 7.7.2.

7.9.1 Cross-faculty and departmental ownership

Faculty and departmental ownership is relevant to governance. DMU is trying to develop cross-faculty and departmental ownership mainly through the Sustainable Development task Force (SDTF) membership. The observations suggest that it is not fully developed and the representation from faculties is weaker in the process. In the SDTF meeting held on 24 February 2014, the Director of Sustainable Development stated that *"we are not embedding things deeply as we should be".*

However, there is a good sign to move towards an integrated approach to SCM, as the environment team is trying to speak to different faculties and departments and engage them. The Environmental and Sustainability Officer highlighted that currently, faculties and directorates within the university are not aware of how they contribute to the overall carbon footprint.

> *"Currently faculties and directorates within the university are not aware of how they contribute to the overall carbon footprint"* [Environmental and Sustainability Officer]

This could be due to their focus on primary role and responsibilities. At the moment, estates departments are having ownership for carbon management, but estates managers want other stakeholders to participate as well. DMU has plans for integrating carbon budgeting to develop ownership for carbon management throughout the management and governance practices of faculties and departments. This can address carbon management at a whole-organisation level. As far as the statistical results are concerned, some respondents believe that there is cross-faculty and departmental motivation and ownership of carbon management across DMU (i.e. within and between functions and roles) because three respondents agree and one strongly agree. In contrast, three neither agree nor disagree and one disagree. This suggests that SCM is not fully embedded at faculty and departmental level in the university.

Carbon budgeting

According to the environment team and the SDTF meetings, responsibility for reducing carbon emissions rests with staff and students. Therefore, a trial programme of carbon budgets across faculties and departments is taking place to demonstrate how each faculty and department can contribute to carbon management and share responsibility of achieving the targets through responsible governance and management. Carbon budgeting places a restriction on the total amount of emissions which a department or faculty in a university can emit over a certain period of time. Carbon budgets are an innovative mechanism that can help raise awareness of energy consumption and reduce emissions (The Carbon Trust, 2014). The pilot programme at DMU started with the Faculty of Technology and includes developing a web based system to record scope 1, 2 and 3 emissions. The IESD and the Estates & Commercial Services envisaged the development of a working prototype of an integrated ICT monitoring and reporting system of emissions. This will include all emission sources and be based on the tools and lessons learnt from the sustainable procurement project, $PROCO_2$ (Bull et al., 2013) and the energy saving project using ICT, Smartspaces. This integrated system built in a flexible IT architecture aims to involve a platform for data management. It will store raw data obtained from the university information systems in a database and will estimate the associated emissions by sources and by faculty/department using established methodologies. The system will initially include emission sources that have a high priority to meet the targets and

necessary data that comes from automated information systems such as Databird, QLX (DMU's finance system) and travel agency databases.

Carbon budgeting was not discussed in the first phase of the research. None of the universities has adopted this yet. However, there is a budgeting mechanism for electricity usage in some universities in the UK. The main issue is the data used to estimate emissions due to uncertainties. The data do not allow to breakdown emissions by faculty and department. The emissions sources to be initially included in the budgeting system are electricity and gas use, water consumption, procurement, business travel and waste management. Further efforts are required to improve accuracy in estimating the remaining scope 3 emissions such as staff and student commute and UK-based and international student travel to be included in the carbon budgeting. The other limitation is associated with data quality to estimate these emissions and difficulties to allocate emissions to different departments. Carbon budgets were planned to be allocated in 2014/15, but the progress has been slow and it is not done yet. According to the Research Fellow, who is a member of the SDTF and is involved in carbon budgeting, and the SDTF meetings, this was because of a lack of financial and human resources. DMU has been trying to implement carbon budgeting for last two to three years. However, once implemented, carbon budgets are able to establish a pathway to ensure that the carbon reduction targets are achieved. At a later stage, DMU aims to roll out carbon budgets to the whole university. This was mentioned by a member in the July 2013 SDTF meeting.

> *"Following conclusion of the pilot and tweaks following lessons learned, the project would be rolled out more widely across the university, including central service units in 2014".*

However, this is still not implemented at DMU due to a lack of resources, as mentioned by the Research Fellow and the Director of Sustainable Development. There also appears to be a lack of understanding and availability of best practice in the sector, as reflected by the Head of Estates Operations at a Russell Group University in a LinkedIn conversation.

> *"It is something I was unfamiliar with. I can see academics offsetting their consumption - it looks potentially very complex to manage. Previously at Nestlé, we sold energy to departments and that is something I think we are possibly heading towards at Y, but I am afraid we can't help you with carbon budgeting"* [Head of Estates Operations]

Senior management perceive the role of carbon budgets and believe that the budgets could offer quantitative figures and evidence to bring organisational change. In addition, carbon budgeting could enhance stakeholder engagement.

> *"I think that would be helpful because it would force people to think more analytically about carbon. Without carbon budgets, it's quite qualitative, you don't see it and you don't see the difference/changes we make"* [Pro Vice Chancellor]

Individual departments not paying energy bills can be part of the problem. The Head of IT Operations, who is a member of the SDTF, argued that individual departments need leadership on this

issue and should control finances in regard to energy bills. In this way, the individual departments will focus on energy consumption and could reduce emissions.

> *"Somebody centrally needs to own and understand what we spend in terms of energy and then, that individual and team will actively seek to drive down that number. So, what we spend, what we have in terms of gas utilisation, electricity utilisation and water utilisation. That needs to be on downward trend and we do that"* [Head of IT Operations]

During January 2015 SDTF meeting, it was discussed that work is in progress to apportion local energy budgets to incentivise local cost centres to work with the energy manager to reduce costs, not only related to carbon footprint, but to include gas and water consumption. The Director of Sustainable Development highlighted the potential issues related to multiple occupancy of buildings and stated that buildings without sub metres would require attention of local cost centres. The work is underway to learn from other universities that have undertaken similar projects.

7.9.2. Communication

Communication was not a common theme in the first phase of the research; however, CMPs discuss communication plans (Section 5.10.1). Communication was an important theme in SDTF meetings and was discussed in detail as one of the main items in governance. Due to its significance, members of the SDTF encouraged the estates department to work together with the marketing and communication directorate. The staff survey 2013 demonstrated that there is low level of awareness of environmental and sustainability initiatives within DMU. This suggests that there is a lack of effective communication in the university. The Senior Media Officer argued that the university has not got the key message right and members agreed that it was essential to identify key messages and the target audience for progress to be made. The Director of Sustainable Development noted in the SDTF meeting in October 2013 that communications had previously been a difficult area for sustainability agenda and at present, this is a challenge. Moreover, faculty updates is an important activity in the SDTF meetings. Faculty sustainability updates are limited to posting news in the faculty newsletters and circulating information through emails. The role of Environmental Champions network at DMU is also limited. This is not enough and people do not know what the environment team is doing in this area. This also suggests a lack of faculty and departmental ownership and engagement. In June 2015 SDTF meeting, the Director of Sustainable Development argued that a re-focus of faculty reports is needed and strategic issues are not being addressed by these faculties. The reports seem to be introspective and require focus on more proactive consultation.

Three interviewees discussed communication for the SCM process. The Director of Finance believes that people are relatively more aware of carbon management issues through various communications than they were few years ago. However, people do not necessarily consider carbon management into

their day-to-day life. According to the Director of Finance, this is a barrier due to a lack of communication. Furthermore, the Senior Media Officer quoted:

> ***"****It is an important thing. The difficulty has been translating carbon management which has become academic topic and it is difficult to communicate it to first year dance student. It is communicating in an appealing way and main thing is how do you do it?"* [Senior Media Officer]

The above quotation suggests that carbon management is important, but the challenge is to communicate it in an effective and understandable way. It is an academic topic for many of the stakeholders. The Energy Manager mentioned that DMU has provided all the carbon management related information at the website to enhance communication, but this transactional communication may not be enough. DMU has a Marketing and Communication Directorate with two core functions, internal and external communications. According to the Senior Media Officer and discussions in the SDTF, the directorate has a key role to communicate carbon management messages. The environment team and the SDTF are keen to work in collaboration with the communication directorate.

Researcher: What is the role of communication directorate in carbon management/environmental sustainability at DMU?
Senior Media Officer: I think there is strong role, but difficulty is spreading the message across. How can we align the message? It is drawing the message together and communicating in an effective way. Drip feeding won't work.
Researcher: Do you or your department feel involved in carbon management process at DMU?
Senior Media Officer: We had several meetings and been requested what we need to do and it all depend on IESD, what they want to spread in message. Our role of communication is later. We need first and foremost role from IESD. Estates have been keen on these issues. We liaison with the Environmental and Sustainability Officer and we have a key section in internal newspaper.
Researcher: What are the communication issues (barriers) around carbon management and environmental sustainability?
Senior Media Officer: Certainly, sitting in the SDTF meetings, there are a lot of problems.

1. Drawing it in one message. Drawing it together in an understandable way and people relate it to what they do.
2. Getting the key message right.
3. At the moment, IESD do not want to say about itself, define itself. IESD have to work with us collectively and tell us what they want to achieve and who do they want to tell and what? Who they want to talk to and what they want to say in clear terms. Every university is saying that, but you need evidence. IESD has done a range of projects. Take a common theme and say to a journalist, we have done this and here is all the evidence. It is about giving evidence.

Table 71: Interview extract discussing role of communication

The Senior Media Officer stated that the communication department is working in collaboration with the estates and IESD. It is agreed that the university needs to communicate innovative success stories to provide evidence to be a leader. The Senior Media Officer identified key barriers to communication such as the university's inability to present an understandable message, lack of collaborative working and evidence based communication. He suggested getting the key message right and enhancing evidence based communication. Although the IESD is working with the estates department, more

needs to be done. The DVC was of the view that DMU needs education in simple terms which people can understand as it is a complex topic and this could be beneficial for the university. This suggests that educated and well informed staff and students can help contribute the carbon management agenda and effective communication is a key to that.

> *"I think the clue to all this is education and well produced material on the web and in documents that explain the importance of the green agenda in clear terms, not full of jargon, not full of in-house abbreviations that nobody understands, but explains it in simple terms that ultimately, we all benefit enormously from a focus on green issues"* [Deputy Vice Chancellor]

Means of communication

This theme explores the means of communications DMU is using. The majority of survey respondents (five agree and two strongly agree) believe that carbon reduction targets, strategies and performance are communicated to the relevant stakeholders. The university uses its website to communicate carbon management messages. The DMU's energy policy states that the university aims to develop an 'Energy and Water Web Site' adjacent to the estates department web pages. This will be the primary channel of communication to staff and students. The website will mainly include an introduction by the VC, Board of Governors and /or Chief Operating Officer, the current energy and water usage, the environmental legislations applicable to the university and the cost data for the buildings (DMU, 2012). However, this is not done yet and communication is done through ad hoc methods. The Environmental and Sustainability Officer provides quarterly energy reports to all of the Environmental Champions in buildings, but staff receiving the emails may not read it. The web pages will present data for electricity, gas and water consumption as live data (DMU, 2012). DMU (estates department and IESD) have been working to identify the effective ways for energy communication to building users, which is a challenge. A range of different websites and applications are designed as part of this approach (DMU, 2012). Despite this, there has been less engagement. The 2013 staff survey results, as mentioned in the July 2013 SDTF meeting, show:

> *"Whilst communications across the university were considered to be poor in many areas. The most popular method of university wide communication is the staff internet pages".*

The above quotation suggests that there is poor communication and staff web pages are a popular method for communication. Table 72 presents means of communications including both internal and external. The Senior Media Officer highlighted how the university can communicate its carbon management program effectively.

Researcher: Which forms of communications are currently being used within DMU? **Senior Media Officer:** Means of communications are plasma screens, staff and student specific emails and news, social media (SustainableDMU Facebook and Twitter) and Cascade. These are sources of internal communications. Sources of external communications are newspapers and TV news. However, for young people, social media is important. Social media is important for politicians too and they see it. **Researcher:** How DMU can communicate its carbon management program effectively? **Senior Media Officer:** What do you need to say? Who do you want to say? Where is the evidence? We cannot help if we are not putting it in a simple way. Then, it won't be effective and will not have positive results.

Table 72: Interview extract demonstrating means of communications

The other forms of information provision such as corporate induction and the health & safety induction received more favourable responses from staff. There are very few people in the environment team to communicate with the whole university, appearing to have limited resources, as found in Section 7.7.2. However, modern techniques and ways of communication are used. In order to help staff and student engagement, DMU has been developing systems including apps and tools to provide feedback on energy and water consumption such as smartspaces. These smart technologies form part of ambition to be a smart campus. Dahle and Neumayer (2001) argue that investing in energy management tools is not useful unless people know how and why we are doing this, so engagement is critical.

Smart campus

This term 'smart campus' emerged in the SDTF meeting more than a year ago. Smart campus is aimed to be used to promote DMU's carbon management and sustainability work. The design and operation of a sustainable university, a 'smart campus', is informed by evidence based research, teaching and knowledge transfer. It includes transferring knowledge from research output, engaging with staff, students and the community. However, this is not happening yet and there seems to be a long way to go. The members of the SDTF encouraged working with the communication directorate for the promotion of smart campus. The smart campus could provide a single 'strap line' around which DMU can communicate the university's comprehensive approach to carbon management. The idea of this approach was discussed in the SDTF meeting held in October 2013. The observations suggest that the Director of Sustainable Development is keen to take the smart campus initiative forward and gain reputation in the HE sector.

7.9.3. Whole organisation approach

Carbon management requires a holistic enterprise-wide response (Dembo, 2008). Whole organisation approach is an integrated and comprehensive way to manage carbon emissions. This theme investigates whether DMU has whole organisation approach to SCM. DMU aims for a comprehensive approach to measuring and reporting carbon emissions as reflected in policy documents and the SDTF meetings. As part of this approach, the university does not only report emissions from energy use, but

also emissions from other sources such as international student travel, UK-based student travel, waste, water and procurement. Observations of the SDTF meetings indicate that there is a lack of faculty and departmental engagement. The next step for the SDTF is the engagement of all faculties and departments to achieve integrated and comprehensive whole organisation approach. This is a challenge for the university. Furthermore, whole organisation approach was discussed with five interviewees during the case study investigation. The extract of the interview with the PVC is presented to demonstrate whether SCM is embedded to ensure the whole-organisation approach.

Researcher: Do you think that carbon management and sustainability is only in middle of the organisation and it lacks at the bottom and top of the organisation? **Pro Vice Chancellor:** Yes, I think that's why we have the SDTF. I am on that and I am representing the EB. It brings together people from around the university. SDTF is made of estates and other people from around the university who can oversee in a sensible way how we are doing as a university and we can join things up. If we didn't have the sustainability task force, it would just be estates and that wouldn't be the right way of doing it. **Researcher:** How do you think carbon management can be mainstreamed at the whole organisation level? What are you planning to do? **Pro Vice Chancellor:** It's an incremental thing. I think one way of getting focus on carbon, I am not sure if this is the right way of doing it, is to cost out everything in terms of carbon rather than pounds or as well as pounds. So you could have dual costing, one set of costing based on pounds, one set of costing based on carbon. We don't do that but that would be one way of forcing people to more carefully consider the implications on what they do on carbon footprint. But, I think it's generally about raising awareness. At the moment, as most of our university is aware our carbon footprint is important, but it's not something we automatically think of straight away. We need to get to a position where we think about doing something, one of the first things we think of is the carbon footprint. That's cultural change and that will take time and the way to embed that change is to keep raising profile of these things.

Table 73: Interview extract demonstrating whole-organisation approach to SCM

The above extract illustrates that carbon management is not a part of whole organisation and seems to exist in the middle. The PVC was of the view that the SDTF builds engagement of estates and other departments, but more participation is from estates managers in majority of the initiatives. In the SDTF meeting held in October 2013, members noted that there would need to be holistic approach to carbon management. However, the Director of Estates argued that carbon management is embedded within all of the estates operations. An effective carbon management programme is embedded into the university's estates strategy including sustainability, environmental and facilities management policies. This aims to diminish administrative costs and maximise cooperation (HEFCE, 2010a). The PVC was of the view that carbon budgeting could help mainstream carbon management. The DVC stated that we have to be realistic and finance is a barrier sometimes. Moreover, circumstances can undercut agendas that the university knows ethically are important and sometimes, universities are in competition with each other. This is in line with the discussion in Section 7.6.4. The Director of Finance stated that the finance directorate is receptive and can take things forward, but carbon management is not embedded in finance department. This has implications for procurement.

> *"I don't think carbon management is particularly embedded within the finance directorate. How would you ensure that understanding and knowledge is shared within the institution? I don't think we got that emphasis"* [Director of Finance]

The Head of IT Operations reported that the Information Technology and Media Service (ITMS) is working in a traditional way and carbon management is not embedded in operations. At present, DMU's ICT estate and infrastructure is not energy efficient, but the ITMS is aimed at moving forward. The Head of IT Operations stated that DMU is trying to implement an integrated approach to SCM.

> ***"****The university is trying to move towards an integrated approach, but how effective they are in terms of pushing the messages is a different story"* [Head of IT Operations]

There are universities in the UK who have developed Green ICT strategies. Currently, DMU does not have a green ICT strategy. During the interview, the Head of IT Operations mentioned that DMU has an ICT strategy which includes sustainability in it. The department tends to consider sustainability in its operations, but it has not been effective. This suggests a lack of an integrated strategy. In addition, carbon or environmental sustainability is not part of DMU's risk management policy and strategy. The risks and opportunities associated with carbon emissions need to be integrated into the formal risk management system remains insufficient and unclear within organisations (Subramaniam et al., 2015). Carbon, energy and sustainability policies and strategies are disjointed and standalone in the organisation.

7.10. Responsibility

The first phase of the research (Section 5.13 and 6.10) found that strategic responsibility lies with senior management or VC and operational responsibility lies with middle managers in estates. The majority of the interviewees think that carbon management is responsibility of everyone, as in Section 6.10 in Chapter 6. There is a lack of clarity over day-to-day responsibility for implementing strategies in DMU, as found in the survey. There were varying responses on the issue of responsibility and respondents named different individuals to be responsible for implementing carbon management. The Director of Sustainable Development and the Energy Manager himself stated that 'Energy Manager' is responsible for carbon management. The Director of Estates, the Environmental and Sustainability Officer and the Transport Coordinator reported that the Environmental and Sustainability Officer is responsible for carbon management. The Research Fellow said that the team in the estates department and the Head of Estates said that the Environmental and Sustainability Officer in conjunction with the IESD and the SDTF are responsible for day-to-day implementation of carbon management. These observations indicate that estates/middle managers have all the responsibilities in regard to carbon management, but they do not have participation in strategic decision-making process. This may affect the implementation carbon management. Personal experience of the researcher suggests that many of

the stakeholders in the university perceive that the Environmental and Sustainability Officer is responsible. One of the documents of the October 2013 task force meeting stated that responsibility for reducing emissions rests with staff and students across all faculties and departments. They are advised to share responsibility for achieving the targets. However, there is a lack of responsibility among staff and students due to lack of engagement, as discussed in Section 7.8.1. The Green Impact survey conducted in the Queens Building and the Kimberlin library suggested that students consider environmental issues important, but they are not aware how to contribute and have a lack of knowledge and understanding.

Five interviewees (four were members of the EB) were asked about the overall (strategic) responsibility. The strategic responsibility for carbon management is also not clear and interviews named different individuals and groups for this. The PVC stated that the overall strategic responsibility lies with the VC, whereas the Director of Estates and the Environmental and Sustainability Officer is responsible for delivery.

> *"Well ultimately, it's the VC because he has overall responsibility for everything. But, that's delegated to the SDTF and also estates, the Director of Estates and the Environmental and Sustainability Officer, people like that have a role in estates in delivering our sustainability plan"* [Pro Vice Chancellor]

In contrast, three interviewees argued that the Director of Estates has overall responsibility. The Director of Estates himself stated that he has overall responsibility for it and he takes lead on this agenda. According to the Director of Finance, the Director of Estates is responsible for reporting the performance to the HEFCE. Two interviewees named the VC and three interviewees argued that ultimately the EB have the responsibility. This suggests that there is no clarity over strategic and operational responsibility.

7.11. Discussion and conclusions

This chapter presents an in-depth study of SCM practices at DMU from the stakeholders' perspective. The study found that carbon management was part of DMU strategic plan explicitly, but this is no longer the case. This is in contrast with Subramaniam et al. (2015) who recommend that incorporating carbon perspective into strategic plans can ensure effective corporate carbon management in organisations. However, this may be due to the changing nature of the HE business in the new financial regime where teaching, research, student experience and recruitment receive more attention. However, middle and senior managers perceive carbon management as a strategic issue that should take precedence. Middle managers in the estates are proactive, but they are restricted due to organisational barriers. Senior managers understand carbon management and its strategic role without any complex technical details and pay more of 'lip service'. However, their perception towards the

role of carbon management is encouraging, despite whether they prioritise it or not. These findings complement Millar et al. (2012) who argue that business leaders acknowledge sustainability as a critical issue and a source of opportunity for and risk to the competitive advantage. Similarly, Okereke (2007) argues that climate change is a matter of strategic choice. Predominantly, carbon management is strategic as far as policies, plans and strategies are concerned and there appears to be a lack of strategic implementation. This is in line with the McKinsey's survey which found that majority of the executives consider climate change as an important issue, but implementation is limited (McKinsey, 2008). In DMU, there are commitments in policies and strategies that have not been implemented suggesting a disconnect between policy and implementation. There are claims from the senior management which are not true in reality such as the embeddedness of sustainability in the curriculum and the EB, as there is not enough evidence to support this.

Despite this, DMU has been improving its performance year on year in different areas of carbon management with pro-active initiatives and good practice. The university has diverse policies to address scope 1, 2 and 3 emissions. DMU was the first English university to carry out the leading work in the sector to calculate consumption-based carbon footprint of all of its sources and then set targets for scope 1, 2 and 3. There are not many universities that have developed targets for scope 3. DMU has already met its carbon reduction target of 12% and is striving for 2020 target. However, an external analysis of Brite Green (2015) suggests that DMU is not currently on track to meet its targets. Therefore, DMU needs to control its increasing carbon emissions. Schemes such as the UL and the EMS indicate DMU's focus on carbon management. DMU achieved highest ever position of 11th out of 151 participating UK institutions in 2014. This demonstrates continuously improving performance. Despite long delay due to limited resources, DMU is half way through the implementation of ACORN to achieve an integrated approach to carbon management. Despite all the policies and strategies and the work DMU has done, it needs further improvements.

Senior management leadership is a critical factor, as it was found by EAUC et al. (2015a). In DMU, senior management is not fully committed to carbon management and has not actively bought into the process. It is not their first thought in the EB and the practical commitment is not visible at wider organisational level. Their participation is limited to strategic aspects of carbon management only and they do not have active role in the implementation. There are concerns such as carbon management not being part of the new strategic framework and the PVC not chairing the SDTF anymore. Now, the Director of Sustainable Development chairs the SDTF, but his position and authority is not clear in the organisational structure. It is also unclear who he reports to. Furthermore, he is not a part of the EB and would need coordination of the PVC in reporting and getting approval of the proposals put

forward by the environment team. This suggests a gap between the EB and the middle management within the estates. Senior management can influence carbon management through strategic decision-making and management process. Committed senior executives are able to integrate carbon management in decision-making and management procedures; otherwise, this may not take precedence. At the moment, senior management seem to believe that carbon management being part of policies and plans is good enough, but it is not. This is not considered into DMU's decision-making; rather it is an afterthought in the decision-making and management processes. This is not part of wider strategic discussions in the Board of Governors and the EB. Like other universities, DMU is facing conflicts between carbon management and the core business, which has a preference. The core business has a priority because DMU wants to gain reputation and be a profitable university. Students are now paying increased fees and are not seen to be interested in carbon management. Carbon management has secondary priority, but it is still considered important. DMU is interested in carbon management as far as it does not affect the core business or if it aids the core business. In contrast, the university may prioritise core business based on the benefits it can bring. However, the university may support carbon management if they are linked to social and economic aspects, as the university is keen on economic and social sustainability.

Funding and resources emerged as a critical factor. There are mixed opinions on the availability of funding and resources, where some managers believe that there are financial and managerial resources available for projects; whereas the other group reported that there is a lack of funding and resources. Some projects are not implemented due to lack of funding and there is an agreement that more funding will be helpful. The senior management make financial decisions and increased investment is important. The financial position of the university plays an important role in the investment because financially sustainable university is more likely to invest on projects and could gain business benefits in return, as suggested by Jackson (2008) and Busch & Wolfensberger (2011). Sometimes, the university can be restricted in terms of finance due to other priorities. Non-technical behaviour change and engagement projects do not cost much, but technical project are relatively capital intensive. However, as a result, heavy capital cost may result in less operational cost. A strong business case for any project has a key role to play for securing funding and the main criteria for business case is the payback period and energy and carbon savings as well as non-financial benefits. Longer payback period can be a problem for the approval of business cases. Carbon management is not part of the HR strategy. The POD can have a bigger role, but it is not playing an active role to embed carbon management. This department has an opportunity to engage staff in a better way due to its influence on staff. Carbon management is not encouraged in organisational development procedures. The environment team is small as compared to many other universities. The Environmental and

Sustainability Officer is the leading person and is involved on a range of projects and appears to be overworked suggesting that the environment team would need more skills-based HR. The UL results provide evidence for a lack of HR and this is in line with HEFCE (2009a) stating that there is a deficit of skills across the sector.

The SDTF meetings and interviews suggest that DMU is focused on enhancing stakeholder engagement, staff and students, through various strategies, but it has not secured much success. The staff includes administrative/professional services and academic staff, both at a senior, middle and junior level. Staff and student engagement is a key challenge universities are facing including DMU. Despite many efforts, there is a lack of staff and student engagement. This is supported by Dahle and Neumayer (2001) who argue that staff and students are careless about green agenda. This may be due to lack of time and being busy in studies and main job role. For students, time is the main issue because there is so much to be involved throughout the year. Staff and students may not find carbon management of interest resulting in a lack of engagement. There is a small population who are engaged either through the Green Impact or other projects suggesting that students and staff do not effectively contribute because they do not participate in most of the activities, even if they think it is important. The role of student unions is a key, but there is a lack of engagement from the DSU. DSU is not involved in the environmental projects in comparison to other projects. They could use their influence on students and could develop interest for carbon management. The DSU representative sitting in the SDTF is not enough, as this is not representative and lacks active participation. The Vice President Welfare attends the meetings, but she is not actively involved due to a lack of knowledge and time. Similarly, the nature of subject may be a problem for many of the staff and students. There is less engagement from academic staff. The engagement of academics is not visible at organisational level and they seem to work in silos. Dahle and Neumayer (2001) state that academics are uninterested and busy in their work and therefore, are not able to participate in the process.

The study found that carbon management is predominantly an issue of the estates department (environment team) because the main contribution to implement SCM is from the estates. This does not support whole-organisation approach to it. Butt (2014) argues that sustainable practice is not yet a cultural norm within universities. Therefore, this positions carbon management in middle (estates level) of the organisation suggesting a lack of integrated and whole-organisation approach. This indicates that carbon management is not embedded into the whole-organisation. This is in contradiction with Dembo (2008) who suggests a holistic and organisation-wide response to carbon management. Officially, estates department in general and the environment team in particular are implementing SCM suggesting that it is not embedded into other departments and faculties. However,

all of the departments have a key role. The other departments might think that this is not on their agenda and could be focused on their primary role such as finance, HR and communication, but the thematic analysis suggests that they can have an effective role. Finance department can ensure sufficient funds for implementing carbon management projects. HR can train, develop and embed carbon into job roles of staff to facilitate their active participation. Communication department can support the environmental team for engaging staff and students through innovative communication channels. The environment team has not been able to engage other departments and faculties to the level, they would like to. Individual faculties and departments not paying energy bills can be part of the problem. DMU is in the process of adopting an innovative approach of carbon budgeting to develop ownership, which has not been adopted by any university yet. The energy/electricity budgeting schemes are implemented in three universities and DMU's progress on this initiative is slow due to lack of resources.

The responsibility, both operational and strategic, is critical for implementing carbon management. In DMU, there is no clarity over the responsibility. In contrast, HEFCE (2010a) suggested a clear line of responsibility. The study found that there is ambiguity on this issue among members of the estates/environment team and the SDTF members, which is indicative of the situation in other universities. The majority of the interviewees reported that carbon management is responsibility of everyone and this is an ideal situation. However, there is a lack of clarity over the operational day-to-day responsibility in DMU, as found in the survey. There were varying responses on responsibility and respondents named different individuals. This may be due to a lack of coordination between individuals and departments. HEFCE (2010a) reports that responsibility varies in universities. The observations suggest that estates/middle managers have responsibility, but they do not have participation in strategic decision-making, so it may affect implementation. They seem to have more responsibilities and less authority. The first phase of the research found that strategic responsibility rests with senior management or the VC. In contrast, it is not clear who has the strategic and overall responsibility. There is no accountability at senior management level. Wehrmeyer et al. (2009) argued that clear board level responsibility and accountability is needed. Interviewees named different individuals and groups for it indicating no clarity over the championship.

The findings reveal that DMU is indicative of the wider HE sector in the UK. Other universities across the UK are experiencing similar issues to implement SCM such as a lack of senior management leadership (EAUC et al. 2015b), funding and resources, responsibility, business growth, competing priorities and policy issues. The study of the Brite Green (2015) found that the majority of the English universities are falling behind their carbon reduction targets and only three are projected

to be on track. This also complements EAUC et al. (2015a). It appears that the universities have placed their carbon management responsibilities on the back burner as a result of change in funding stream to institutions. The emphasis is now for institutions to be financially sustainable by any means possible in a market driven environment and spending time on carbon management issues may not be the best use of their time and resources. There is no accountability of the carbon management performance. In reflecting on its achievements and challenges, DMU needs to determine how it aims to improve and embed carbon management through the whole-organisation approach and follow through on them via allocating responsibility to key members of staff. The case study provides evidence that DMU is committed to carbon management beyond policy compliance. Overall, the picture appears to be positive with gradual progress continues to be made, but further work is needed in key areas, as identified in this chapter. Figure 32 presents the Critical Success Factors (CSFs) for improving and embedding SCM in universities. These are derived through the synthesis of the key themes discussed in Chapter 5, 6 and 7, based on the level of importance for implementing successful carbon management. The key findings are also presented in Table 74.

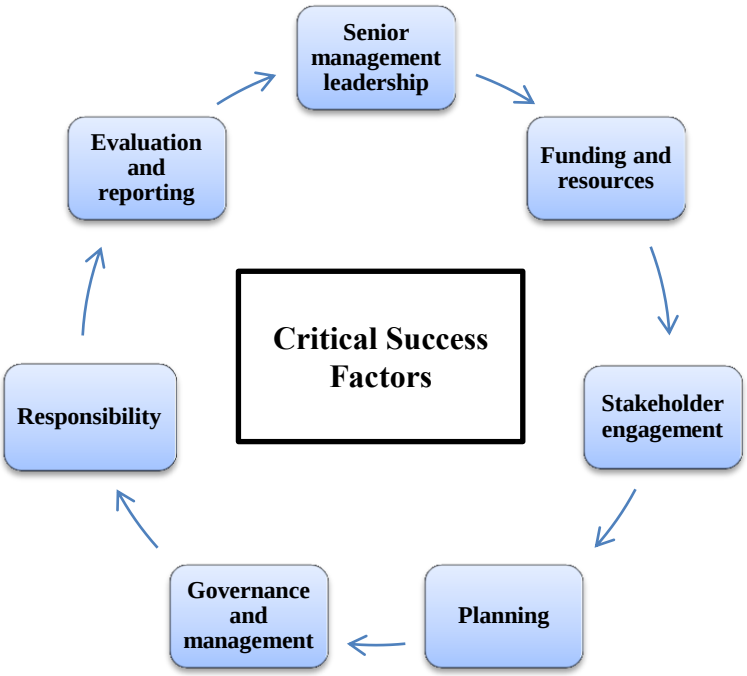

Figure 32: Critical Success Factors (CSFs)

No	Objectives	Key research findings	Themes/CSFs
4	To identify critical success factors for effectively implementing and embedding strategic carbon management in universities	• In DMU, senior management leadership is not fully engaged in the carbon management process. Carbon management is not their priority, sometimes due to conflicts with the core business, however, it is considered as important. It has been one of the strategic issues in the strategic plan, but now it is driven back due increased focus on the core business, as a result of the market driven environment in the sector. It is not considered into strategic decision-making and management processes; rather it is an afterthought. (see Section 7.6) • There is a lack of effective stakeholder engagement in DMU with only a very small population of staff and students engaged (including academic and DSU). Carbon management predominantly lies within the estates department solely with practitioners and other departments work in silos and are restricted to their business functions. This indicates a lack of whole-organisation approach, i.e. not embedded within the organisation. (see Section 7.8) • There is no clarity over responsibility for carbon management. The line of responsibility is unclear including operational responsibility and strategic responsibility. The estates/middle managers have operational responsibility as their job remit, but they do not have participation in strategic decision-making process indicating a disconnection between operational staff and senior management team. In DMU, it is also not clear who has the strategic responsibility and there is no accountability at the senior management level. (See Section 7.10)	Strategic issue, Senior management leadership, Corporate strategy, Strategic decision--making, Stakeholder engagement, Whole-organisation approach, Responsibility

Table 74: Findings from objective four

Chapter 8: Strategic or pragmatic? A framework for strategic carbon management

8.1. Introduction

This chapter proposes a framework for strategic carbon management (SCM) to improve and embed carbon management into universities, other public sector organisations and beyond. This framework also reflects on the key features or elements, i.e. critical success factors (CSFs), for the effective implementation of carbon management. The definition of SCM is proposed and practical and policy recommendations for improvement are made.

8.2. Framework for strategic carbon management (SCM)

The fifth objective of the research was *"to develop a best practice framework for strategic carbon management within HE and other public sector organisations".* The themes/sub-themes of the study and the CSFs (see Figure 32) are referred as constituents of the framework, which set out a coherent and integrated approach to best practice SCM, informed by first-hand empirical research. However, 'one-size-fits-all' approach does not exist to develop carbon management strategies (HEFCE, 2010a). Therefore, this generic framework is developed and proposed to universities and other organisations as a set of guidelines. This multi-faceted framework situates the key findings into the debate around SCM to address climate change mitigation and can be applied through a process of continuous improvement to assess and then embed carbon management practices in any university regardless of the country. This framework presents the qualitative issues surrounding SCM and has considered the key factors including the CSFs which potentially could impact on SCM practices. Figure 33 presents the framework for SCM with details of its three levels and constituent elements.

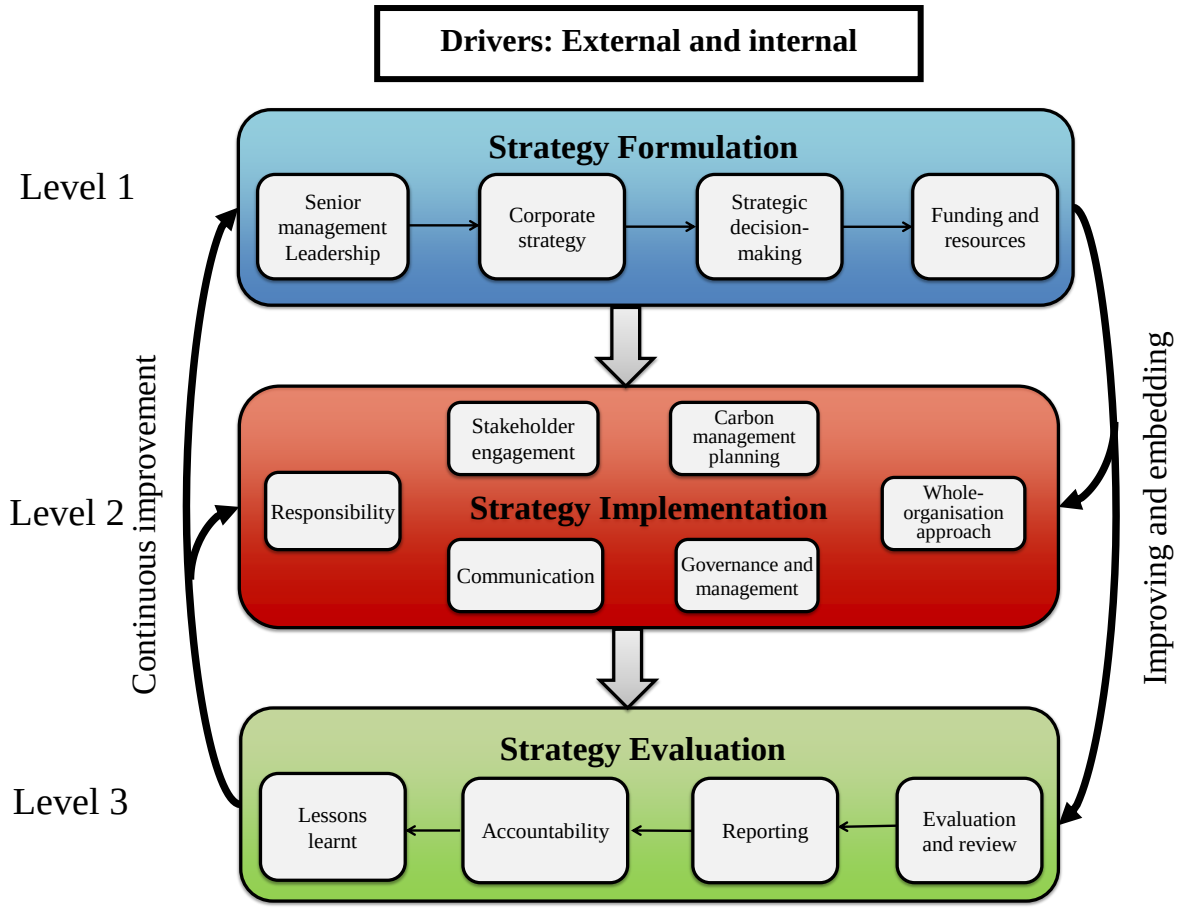

Figure 33: A framework for Strategic Carbon Management (SCM)

The research evidence suggests that carbon management in universities is not strategic in reality. Therefore, a framework for strategic carbon management (SCM) becomes necessary for universities providing a practical roadmap and respond to internal and external drivers. The framework has followed the concept of strategic management, which has three elements; strategy formulation, strategy implementation and strategy evaluation and review. The three levels (Level 1, Level 2 and Level 3) of the framework reflect on these stages and this is a continual improvement process. Each level is linked with the other level and informs it. All of the themes and sub-themes presented in this framework are the key features or elements (CSFs), which can support universities and other public sector and business organisations not only to improve, but embed carbon management in whole organisation. Therefore, universities may need to focus on these CSFs while implementing the SCM process.

Level 1

'Level 1' represents the high level strategic management process. At this stage, the main involvement is of senior management leadership as key actors. Senior management leadership need to believe and understand climate change and carbon management and its relevance to the university business.

Senior management commitment is essential to support the implementation of carbon management strategies, as found in this study. The role of senior management in the development of vision, mission, values and strategic plan is key. Leadership needs to come from the top, not the middle managers in estates. Middle managers need to have a senior champion and also understand the interests of key senior management staff and learn how to relate carbon management to them for buy-in. This must be informed by strong evidence and case studies. In essence, senior management leadership is the most important factor (CSF), which can have influence throughout the organisation. The next step is the development of a strategic plan that incorporates carbon management. Universities develop their strategic plans by involving internal stakeholders and senior management have a major role to play including the final approval. Therefore, their role is key as a top-down approach to carbon management to integrate it into strategic plan and aligning it with the core business activities (also core to the business). However, it should not be a document on the shelf and must be fully operational. Carbon appraisal of all projects and strategies is needed. Universities may achieve their strategic business objectives by incorporating carbon management into strategic business management. The embedded strategy will inform decision-making where decisions can be made considering carbon impact of all the activities. All other plans and strategies need to support the central strategy to reduce emissions. The integration of carbon management into decision-making will encourage discussions on how to become a low carbon university at top management level. Successful HEIs will integrate carbon management into decision-making and make it core to the business. Therefore, when the senior leadership is committed, carbon management is integrated into strategic planning and decision-making, they are more likely to provide funding and required resources for implementation. This will encourage middle managers that it is driven from the top and is part of the strategic plan and decision-making and furthermore, funding and resources are more likely to be allocated for projects. Strategic plan and carbon management cannot be realised if there is a lack of funding and resources. Funding is key as the sector must invest £900 million in projects to meet its 43% target, i.e. approximately 1% of each institution's income per year until 2020 (Carbon Credentials, 2015). A list of short, medium and long term projects need to be developed in CMPs and commitment from finance department must be secured, so that the Director of Finance is on board. Overall, level 1 stresses the prominence of carbon management at the strategic management level and greater input of top leadership.

Level 2

Level 2 deals with the implementation of carbon management strategies and demonstrates the middle management issues, as presented in the framework. This clearly demonstrates what areas middle management needs to focus on. The proposed framework in Figure 33 suggests a clear link between senior management responsible for developing strategic plan and making decisions and those that are responsible for the implementation with a bottom-up approach. At this level, all of the stakeholders

are identified and engaged in the whole life cycle of the process. The stakeholders need to be made aware of the potential carbon impact of all the university activities and how can they contribute to it and 'what is in it for them'. Middle management needs to ensure that the internal stakeholders such as staff (both administrative and academic) and students understand the relevance of carbon management and contribute to the process at the individual level during their job and studies and they take ownership of it. Carbon management is considered more of a financial and engagement issue rather than technical (Carbon Credentials, 2015). Therefore, embedding carbon management into the whole organisation demands actions not from the environment team, all stakeholders such as academic staff, administrative support staff, students, senior management, student unions, suppliers, local and national partner organisations and the broader HE sector. Once strategic drive is there, funding and resources (HR and skill base) are allocated and stakeholders are engaged at an earlier stage, carbon management planning needs to be carried out and a comprehensive and resilient CMP needs to be developed which is dynamic, engaging and outward facing. CMPs need to recognise the shift in the sector and they need to have resilience to anticipate, prepare for, and respond and adapt to changes for its effectiveness. Planning needs to adopt whole organisation approach where it measures, manages and targets scope 1-3 and engages everyone in the university with shared ownership. Effective communication is key and strategies and plans need to be communicated across the organisation and beyond, which is a major challenge.

Governance and management for the implementation of carbon management strategies and plans is a key factor. It aims to join-up all the processes at level 2 through effective communication using multiple channels and building ownership at an individual as well as faculty and departmental level. Good governance and management procedures are crucial. Governance suggests a whole organisational approach, which will help embed carbon management in the university by making sure that whatever is in the strategy is implemented. Sullivan (2009) suggests that governance is one of the key areas against which performance can be measured. Responsibility emerged as a key factor in the study. However, there is a lack of clarity over the responsibility and it varies based on the structure of the organisation. Everyone must be responsible for carbon management, despite the fact that environmental managers having official responsibility. The framework suggests a clear senior management level strategic responsibility and middle management level operational responsibility and a clear reporting structure. Both should work jointly towards meeting carbon reduction targets and transformation towards a low carbon university.

Level 3

Level 3 of the process is focused on the 'review and evaluation' to measure performance and report. It emphasises detailed review and evaluation, reporting, accountability and lessons learnt. Once SCM process is implemented, a regular review and evaluation are necessary. There is no robust reporting mechanism, but universities can conduct review and evaluation every academic year and may be

verified by an external consultant/assessor for accreditation or even in house. The next step of level 3 is compliance and reporting. Universities report for carbon reduction commitment energy efficiency scheme (CRC EES), Estate Management Record (EMR), People and Planet UL and benchmark performance against peers within and outside the sector. The sector should come to an agreement for standard reporting system, which currently does not exist. Universities also report to showcase the results of their process to highlight learning experiences to other universities. They have internal reporting requirements where carbon emissions are reported to senior management. An annual progress report is prepared demonstrating carbon savings against the set targets and lessons learnt. The reporting information needs to be publically available online and a set of key actions should be taken to improve performance in the next cycle of the process. The key lessons can be drawn for policymakers and stakeholders aiming to implement carbon management in universities. The lessons learnt may help identify best practices what works best in a particular context, what does not work and why. The best practices can serve as a model for replication and proven practices can be adopted by other universities and public sector organisations. At the end of the three levels, reflections and lessons learning are fed back to inform level 1 and 2 in the next phase of the process. It is also important to learn from the failures. This cyclical system, when implemented properly, can ensure continuous improvement in SCM within universities. The responsibility for the development, implementation, monitoring and review of this framework should belong to the Vice Chancellor, who must be held accountable for overseeing the process, as the specific responsibility of any other member of senior management team has not really worked. The seven CSFs identified by this study, reflected in the framework, for successfully embedding SCM are senior management leadership, funding and resources, stakeholder engagement, planning, governance and management, responsibility, and evaluation and reporting (see Figure 32).

8.2.1. Why a SCM framework?

This practice based framework is proposed rather than testing or modifying any other strategic or change management framework in this study. This is due to not making middle managers a victim of the ever-fickle cycle of management theories and traditional jargons. Butt (2014) also argues that change management models and/or processes which are used to drive sustainability programs are inappropriate. This is the only holistic and evidence based framework for SCM that includes all three levels of strategic management; it suggests what is required to implement and sustain SCM process. None of the existing frameworks explicitly guide universities from the start to the end of their carbon management journey and connects senior and middle management from strategic and whole organisation perspective. The proposed framework suggests breaking the departmental silos and encourages collaboration for implementing SCM. This framework will help universities in a rapidly changing HE market and will help gain competitive advantage by aligning carbon management with the core business. This framework looks at the whole university as a system for change. On the other

hand, universities and other public sector organisations have developed carbon reduction or strategy framework, but they appear to be more operational tools and do not consider strategic issues and integrated approach to SCM. This framework is concise and reflects on the CSFs for improving and embedding carbon management in universities and beyond. It focuses on the issues which are often overlooked by managers. This will help universities which are new to carbon management, if there is any and to the ones which are already implementing and need maturity by embedding it. Finally, this framework can be used in universities, public sector and business organisations of all types and sizes.

8.3. Recommendations for improving strategic carbon management

Research projects not only seek to describe and explain certain issues, but also end with producing recommendations about how to change the current situation and engage in implementing change (Jeppesen, 2005). Universities share commonalities with other organisations and yet are unique. This distinctiveness is important not only to understand the decision-making process, but also in evaluation of the application of research results to other types of business organisations (Shriberg, 2002). The study provides learning for universities and public sector organisations. Universities can say that this is what we do, this is what has worked for us, do it or do not do it because it did not work for us. While this study was based on the experiences of UK universities, it may be relevant to universities and other organisations globally that are seeking to respond to the rising agenda of carbon management, since many of the organisational issues are in common. It is difficult to set out definitive guidance and recommendations for improving strategic carbon management, but the following are offered to help practitioners against the research findings.

- Senior management leadership should understand the unique opportunity carbon management provides and its strategic implications. VC or a member of senior management team must lead by example and take full responsibility for the performance and targets through the implementation process. Head of faculties and departments must also take full responsibility for their business functions. Carbon targets and budgets can be devolved with clear senior accountability. Senior management needs to be communicated, comprehensively trained and engaged effectively in business language with evidence and make them understand different risks and opportunities associated with carbon management. The way forward is to create more business cases to align carbon management with the core business and explain to senior management team that 'Carbon = savings' and is business innovation through robust data. Through SCM, energy and carbon cost can significantly be reduced allowing reinvestment in core business. Success stories should also be shared with them. The Director of Finance can be a 'gateway' to encourage it.
- Carbon management needs to be aligned with the corporate strategy, whilst considering expected business growth. Universities must revisit their strategic management and decision-making processes to incorporate carbon management at the heart of it. For example, it can be

articulated in student experience through joined up projects with the curriculum. Improving management and governance for effective implementation of policies and strategies is a key to transformational change. It should be introduced and discussed as a regular item on the senior management meetings' agenda and link it as a 'core to the business'. For example, the University of Gloucestershire has adopted a long term approach to carbon management, focusing on ensuring that all decisions are informed by carbon emissions and have been successful in reductions despite the growth. It can be made a core process of strategic management and a central part of the performance management review as a KPI, similar to finance. One of the actions can be effectively incorporating environmental indicators such as energy consumption, carbon emissions and waste into auditing and accounting processes.

- Carbon management needs an integrated and comprehensive whole-organisation approach by incorporating into everything university does. For example, universities should carry out formal Carbon Impact Assessment (CIA) before developing and implementing any policy and strategy. This might not stop the university from taking particular carbon intensive actions, but it may influence how these are done. Through CIA, universities will realise the carbon impact of their activities at the strategic decision-making stage. Every business decision must be filtered through the 'carbon lens' to measure and mitigate carbon impact. Potential conflicts between carbon management and business activities need to be resolved and managed through strategic dialogue between different parties involved. Ultimately, an engagement leadership can deliver this, as suggested in Figure 33.
- All of the stakeholders, both internal and external, must be engaged. Every department and faculty can have an impact and therefore, environmental managers need to understand the needs of different stakeholders and make carbon management as relevant as possible to them. For example, the role of finance, HR and the impact they can make. Universities need coordinated approach and all of the departments need to go beyond their boundaries. Stakeholders, particularly staff and students, need to be educated and made aware of carbon management and their role by developing a shared understanding that they are jointly responsible for developing organisational capabilities for it. Sustained campaigns with simple message and carbon literacy will help and develop interest. Academics have a key role due to their influence and need to be engaged in the process. They can further influence students through lectures. Universities need to focus on Education for Sustainable Development (ESD) both formally and informally. For example, formally through courses such as environmental management, carbon management and green business and informally through various networking and engagement activities.
- Human Resources (HR) department has an important role and should be involved in the process. HR should aim to integrate carbon management into day to day life of everybody on

campus to make a bigger impact. Environmental and carbon management related issues need to be addressed in staff and student inductions and through online training courses. Carbon management needs to be a part of job descriptions, contracts and performance appraisal at all levels. It should also be included in new staff training and existing staff re-training to deal with day-to-day practices of carbon management. Staff is more likely to contribute in it when it will be official in the job description. It needs to be integrated into faculty and directorate plans to have cross-functional input and responsibility.

- CMPs need to be optimised with built in flexibility and should be dynamic, which can provide relevancy, impact and effectiveness despite changes in universities. The plans need to address both operational and strategic issues around carbon management aligning with the strategic plan of the university. CMPs need to be easy to understand, engaging and publicly facing to enhance stakeholder engagement, particularly staff and students in universities. Universities need to regularly review and update CMPs to make sure they are relevant and fit for purpose and are able to meet targets. Universities should focus on meeting absolute targets (scope 1-3) to achieve real reductions for climate change mitigation. However, both targets can be reported as long as overall emissions are decreasing. Both absolute and relative reduction targets will provide adequate understanding of the performance while enabling progression to be shown during changes in the university.
- There needs to be an evaluation and accountability in line with policy and strategy measures, so that policies and strategies can be put in place effectively. There needs to be accountability for carbon management at senior management level (ideally at VC level) with clear chain of command. Both senior and middle managers need to review carbon emissions to date to assess the effectiveness of policies and strategies. Universities should also review how successful their corporate strategy and CMP have been and identify the causes of failure of the planned initiatives which were not implemented. In addition, clear lines of co-ordinated operational and strategic responsibility are needed.

Despite the specific recommendations, this research needs to be considered as a set of guidelines to be followed. Generally, this research will be useful for practitioners, academics, consultants and educators. The practitioners in HE and beyond are provided with in-depth knowledge and understanding of implementing SCM process. This research guides practitioners through the process by presenting them the key challenges being faced. The study has provided the environmental sustainability and carbon management research community with a new literature surrounding carbon management process based on actual practices. Readers of this study will have an improved and detailed understanding of the process. The findings provide an evidence based foundation on which future SCM research can be based. The findings will help environmental and organisational consultants working on carbon management. The study provides academics/teachers with evidence

based material of the drivers and barriers, different carbon management approaches being employed by practitioners and the detailed understanding of the implementation process. The research guides teaching staff towards the key messages which can be communicated to students studying carbon management, environmental management or environmental sustainability to enhance learning process.

8.3.1. Policy recommendations

The following are the key policy recommendations arising from this research.

- There are policy measures to manage direct and indirect scope 1 and 2 carbon emissions, but there are no policy initiatives for management of indirect scope 3 emissions. Improvements will only be possible if individual universities collectively take a more strategic and proactive approach in promoting, measuring and managing scope 3 emissions. Mandatory targets for these scope 3 emissions should also be introduced for universities and other organisations. Policy initiatives should also focus on human factors and soft issues around carbon management. For example, through training and development, recruitment and appraisal.
- HE sector should introduce consistent methods to collect data, measure all of the carbon emissions, develop targets and report the performance to respond to inconsistency and complexity of different existing methodologies and systems. In measuring and reporting of carbon emissions, universities need consistency and standardisation to benchmark. The sector should follow a consistent, clear and robust approach for measuring, targeting and reporting.
- While there are different potential avenues available for funding to universities, the government should introduce more funding mechanisms to tackle the lack of capital funding. Smaller energy and carbon reduction projects are funded by Salix Finance, if they meet certain criteria. Universities should also consider borrowing funds through private sector suppliers and Energy Service Companies (ESCOs), may be for capital intensive projects. It can provide technical expertise and a financial mechanism (Sansom, 2014) as well as mitigate risk. Universities should also explore other options of funding such as crowd funding through which monetary contributions can be achieved from a large number of sources.
- To address uncertainty and complexity in the policy landscape (Chapter 2), policy makers should not change policies after the implementation. It causes problems for environmental managers within organisations. There needs to be consistency in carbon policies without rapid changes. Policies should be designed simply and there should not be much resource intensive bureaucratic processes and complexities involved. There needs to be recognition and incentives for high performing organisations and then the drive for improvements will deliver greater carbon savings.
- Practitioners, academics, environmental NGOs and other related stakeholder groups must be engaged and properly consulted in policymaking at both HE and national level to ensure long

term certainty and robustness of policies. This will avoid practitioners' concerns over policy measures and tools in the future and they need to be less bureaucratic.

- The government and the HE sector need to regularly monitor and evaluate policies and track their impact and progress going forward. The government needs to identify what worked and what did not work and why for an informed policy-making processes.
- There needs to be clarity over the future role of the HEFCE after the changes in the HE sector or may be a new mechanism could be developed. The sector bodies such as the Quality Assurance Agency (QAA) need to play their part in monitoring and ensuring improved carbon management performance. The way Research Excellence Framework (REF) and Teaching Excellence Framework (TEF) are a huge deal for universities to show good standard of research and teaching, similar framework can be developed requiring universities to report their carbon reductions over a period of time coupled with incentives and penalties.
- Universities may not be prioritising carbon management because it is not an assessment indicator in international university ranking systems such as the Times Higher Education (THE) and the Guardian and may not have an effect on reputation. Therefore, carbon management needs to be an indicator in the matrix for the assessment.

8.4. Definition of strategic carbon management (SCM)

The term 'Strategic Carbon Management' (SCM) is undefined in the literature (Mazhar et al., 2011). Therefore, this study has proposed a definition of SCM. The narrative exists that carbon emissions offer business risks and opportunities and carbon management has a compelling business case for organisations including universities. A strategic approach to carbon management can play a major role in the success of a sustainable organisation and this led to formation of SCM.

> *"Strategic carbon management is a process of reducing and managing the carbon emissions that arise from an organisation's business operations and embedding this within its strategic management and decision-making processes."*

This definition reflects on two key aspects of SCM process. It entails carbon emissions (greenhouse gas emissions) from all of the sources (scope 1, 2 and 3) associated with the business operations of an organisation. It demands integration of carbon management into strategic management and decision-making process at all levels of the organisation, including individual faculties and departments. The process of SCM could embed carbon management into the whole-organisation through the input of all stakeholders.

Chapter 9: Conclusions

9.1. Introduction

This chapter presents the conclusions of the research study. The aim and objectives are reviewed summarising how the specific objectives and the main research question are addressed. Key findings arising from the research objectives are also summarised. The contribution to knowledge is presented and reflections on the limitations of this research are discussed. The final section makes recommendations for future research.

9.2. Key research findings

This section summarises the key findings arising from this research against the specific objectives, as presented in Section 1.3. These are the findings which are most appropriate for the rapidly changing HE environment. The key findings are presented in Table 75. The case study findings (objective 4) are in line with objective 2, suggesting that carbon management at DMU is indicative of the broader HE sector (see Section 7.11).

No	Key research findings
1	• Climate change and carbon management policy framework is complex encompassing a wide range of policy instruments and measures to be implemented and there is uncertainty in the UK policy landscape. Due to continuous policy changes and uncertainties, the government's commitment to carbon management is questionable. (Section 2.2.3 and 2.2.4) • The national and the HE sector policies are focused on energy related direct and indirect carbon emissions (scope 1 and 2) and do not include policies and targets for indirect scope 3 emissions. Policy instruments are not focused on human factors and appear to encourage technical solutions only. There is also very limited support and advice for implementation. (Section 2.2.3, 2.2.4 and 2.2.5) • HEFCE has played an important role in carbon management and its strategies have provided universities with guidance to implement it. However, HEFCE does not help address specific barriers to change and the focus is more on 'what to do' rather than 'how to do'. HEFCE can act as a role model to encourage other HE sectors nationally and globally to address policy needs with exemplar programmes and policies. On the other hand, the impact of policies is not measured and the question if any of these have worked is still unanswered. Recent changes in HE have weakened the role of HEFCE and the future is uncertain. Carbon management seems to take a 'pause' and there is a lack of strong driver/s. (Section 2.2.5)
2	• Carbon management has started to rise up at the strategic management agenda and universities have shown 'on paper' policy commitment. However, performance varies significantly. Senior management leadership is a critical factor; in some universities, managers have support of senior management and some universities have a lack of leadership. In general, senior management leadership is not visible and their role has been limited. Carbon management is considered strategic, but it is unclear how it is translated into practice. While universities have developed policies and strategies, they need effective delivery. It is not central to strategic decision-making and management and remains marginalised. In addition, carbon management is not prioritised over the core business in this competitive HE market, especially in the new financial regime. (Section 5.6 and 6.4) • Stakeholder engagement, particularly staff and students, is a critical factor for implementing carbon management. Universities are focused on enhancing staff and student engagement through

	various behaviour based programmes and strategies, but there is a lack of effective engagement and substantial progress needs to be made. (Section 5.11 and 6.8) • The responsibility for carbon management varies and is quite dispersed depending upon university structure indicating a lack of clarity. Officially, the operational day-to-day responsibility lies with middle managers in estates department; whereas strategic responsibility lies with a senior manager or director of estates or Vice Chancellor, but it is unclear how much is their role and level of participation within the process. (see Section 5.13 and 6.10) • There is inconsistency and complexity in the existing measuring and reporting systems. There is a range of methods and tools to measure carbon emissions and report performance, each being different. There is currently no standard methodology for comprehensive carbon accounting and universities are only focused on scope 1 and 2 emissions in carbon accounting, targeting and planning. However, selected parts of scope 3 emissions are measured by many universities, but they are lagging behind in dealing with comprehensive scope 3 emissions. Universities have developed absolute targets, but there is criticism on absolute targets due to inherent contradictions with growth. Universities are also using relative targets for reporting. (Sections 5.12, 5.9, 6.6 and 6.7)
3	• Financial savings and government policies and regulations are the most important drivers for carbon management. The other drivers are increasing energy prices, HEFCE policies and strategies and reputation and market position in the sector (see Section 6.11.1). The drivers have almost similar impact on both pre-1992 and post-1992 (including Russell Group) universities in the UK (see Appendix 9). • Lack of time and resources (HR), complex, historical and listed buildings stock, estate development and business growth, lack of capital funding, priority to the core business and potential conflicts, lack of senior management leadership and lack of knowledge and expertise are the major barriers to carbon management (see Section 6.11.2). However, lack of capital funding and complex, historical and listed buildings stock exist more in Russell Group universities (see Appendix 9).
4	• In DMU, senior management is not fully engaged in the carbon management process. Carbon management is not their priority, may be due to its conflicts with the core business. However, it is considered important. It has been one of the strategic issues in the strategic plan, but now it is driven back due to increased focus on the core business, as a result of the market driven environment in the sector. It is not considered in strategic decision-making and management processes; rather it is an afterthought. (see Section 7.6) • There is a lack of effective stakeholder engagement in DMU with only a very small population of staff and students engaged (including academic and DSU). Carbon management predominantly lies within the estates department solely with practitioners and other departments work in silos and are restricted to their business functions. This indicates a lack of whole-organisation approach, i.e. not embedded within the organisation. (see Section 7.8) • There is no clarity over responsibility for carbon management. The line of responsibility is unclear including operational responsibility and strategic responsibility. The estates/middle managers have operational responsibility as their job remit, but they do not have participation in strategic decision-making process indicating a disconnection between operational staff and senior management team. In DMU, it is also not clear who has the strategic responsibility and there is no accountability at the senior management level. (See Section 7.10)
5	Section 8.2 (see Figure 33)

Table 75: Key research findings

9.3. Addressing the research aim and objectives

This section reviews how successfully the aim and objectives were met. The main research aim was:

"To explore if and how universities are responding to the challenge of climate change by implementing strategic carbon management"

Five objectives were drafted to underpin the aim:

- To analyse the global, EU and UK policy landscape around climate change and carbon management and its implications for the UK HE sector.
- To assess university levels of compliance and adoption of the latest carbon management policies and explore the current state of strategic carbon management in HE.
- To explore the drivers for and barriers to strategic carbon management within the HE sector.
- To identify critical success factors for effectively implementing and embedding strategic carbon management in universities.
- To develop a best practice framework for strategic carbon management and recommendations for HE and other public sector organisations.

The research adopted a multi-strategy and multi-methods approach and the objectives were addressed in two iterative phases (see Figure 22). The first phase of the research involved the content analysis of 18 universities' CMPs (Chapter 5) and 17 semi-structured interviews with middle and senior managers in estates departments of UK universities and the other key senior individuals from the HE sector organisations (Chapter 6). Both parts of the first phase research resulted in qualitative data forming a provisional thematic framework for SCM, which contained key emergent themes. The two frameworks were integrated and modified to apply in the second phase of the research that included a quantitative survey of the UK HE sector and an in-depth case study of DMU, as detailed in Chapter 5 (in combination with the content analysis) and 7 respectively. The survey tested the SCM framework on the UK HE sector and explored the state of carbon management within universities. The same framework was modified and applied with selected themes within the case study. The application of the framework in the second phase validated the findings of the first phase. This approach proved broadly successful in gaining insights into SCM process in universities. The study answered the research question and provided results of the specific research objectives to support this. The proposed framework provides a model for how organisations can 'improve' and 'embed' SCM through whole-organisation approach.

To analyse the global, EU and UK policy landscape around climate change and carbon management and its implications for the UK HE sector

This objective was addressed by carrying out a critical review of the policies related to carbon management (Chapter 2). It set the scene by presenting the global, EU and national policy context around climate change and carbon management in general and the HE sector in particular. The policy initiatives of the UK government in last twenty to thirty years were reviewed. It identified the policy implications for the public sector organisations. The role of the HE sector in delivering the UK's ambitious targets was emphasised and the HE sector specific policies were critically reviewed. The key policy drivers for carbon management were explored. This chapter explored the rise of carbon management set in the context of wider climate policy, including how the policy landscape has changed, particularly after the shift in the way universities are funded in a competitive market environment.

To assess university levels of compliance and adoption of the latest carbon management policies and explore the current state of strategic carbon management in HE

This objective was met in combination of the first and second phase of the research by carrying out content analysis (Chapter 5), semi-structured interviews (Chapter 6) and the survey study in the second phase of the research (Chapter 5). The content analysis presented the critical analysis of universities' CMPs The analysis produced themes and sub-themes and helped understanding the approaches being planned and employed by universities. The themes and sub-themes were presented in the form of a provisional thematic framework for SCM. The second part of the first phase research included semi-structured interviews and aimed to explore the current state of SCM, its drivers and barriers. This stage also developed a thematic framework, which was combined with the provisional thematic framework of the content analysis. Then, the integrated framework for SCM was applied to the wider HE sector through the quantitative survey to assess university levels of compliance and adoption of the latest carbon management policies and feed into the current state of SCM.

To explore the drivers for and barriers to strategic carbon management within the HE sector

This objective was met by synthesising the analysis in Chapter 2, 5 and 6 in the first and second phase of the research. The drivers and barriers to SCM were explored in the policy review, content analysis and the semi-structured interviews with managers and participants from HE organisations. The content analysis helped identifying some of the drivers and the interviewees were directly asked about the drivers and barriers being faced by their universities. The combination of both parts of the first phase research produced frameworks for drivers and barriers, based on university managers' experiences. These drivers and barriers were then listed in the survey conducted in the second phase of the research for ranking, according to the level of importance to managers/practitioners.

To identify critical success factors for effectively implementing and embedding strategic carbon management in universities

This objective was addressed by conducting an in-depth case study of DMU (Chapter 7). The case study provided insights into how carbon emissions are being managed within a public sector organisation such as university. The case study explored the process of how a university implements SCM process. The analysis was based on the selected key themes from the framework, which are considered as the CSFs. These factors were then studied in DMU and were concluded. CSFs were collated from the overall study (chapters 5, 6 and 7). As part of the objective, it explored whole organisation approach to SCM, understanding where carbon management is located and how different stakeholders and departments approach to it.

To develop a best practice framework for strategic carbon management and recommendations for HE and other public sector organisations

This final objective was met through the synthesis of the key themes and findings from both phases of the research. The key findings were presented and discussed and the CSFs were drawn. The most important themes and/or the CSFs formed the framework for SCM, which may help improve and embed carbon management in universities and beyond. The framework is a collection of strategic activities universities can undertake systematically. It is an overarching framework and therefore, a set of recommendations for both practitioners and policymakers is also presented to address the key findings.

9.4. Contribution to knowledge

This is the first organisational research study of its type and aims to generate new knowledge by exploring strategic carbon management in universities by taking whole-organisation approach and stakeholders' perspective. It has captured a unique picture of where universities are, with regards to carbon management, at a key moment in time, as the policy context is shifting so rapidly. The research demonstrates the following contributions to the knowledge:

- Generated new knowledge and theoretical insights into the nascent field of SCM, particularly in the context of HE sector organisations, i.e. universities. The concept of carbon management may be well established in practice within the HE and public sector, as described in Chapter 2, however, it is not as evident in academic literature, and hence this research has been a contribution to knowledge. The primary contribution comes from exploring how universities are implementing strategic carbon management to respond to climate change and policies. This addresses the gap in the literature on the subject of organisational carbon management. Furthermore, many of the findings, including those findings relating to the DMU case study, also represent an original contribution to knowledge, as it provides insights into DMU's SCM practices that only someone closely involved would know. However, many of these issues

have been known to professionals working in universities and this study has added value by providing an evidence base to support these claims to help move the debate on SCM.

- Substantive/practical contribution to strategic carbon management process within HE and other public sector organisations. This applied research has produced lessons and stories of success and failure/gaps not only for universities, but also to other public sector organisations and large business organisations. These organisations would have an opportunity to learn from real world research to improve their practices by understanding the key issues. It also provided evidence to support relevant policy initiatives for reducing carbon impact of HE.
- The other contribution to knowledge is made through the development of a framework for SCM to improve and embed it within organisations. The framework reflects on the key areas, critical success factors, where universities and other organisations can focus. The novel framework provides systematic procedure to effectively implement, improve and embed SCM practices in whole-organisation. The research also proposed the definition of 'strategic carbon management'.
- Methodological contribution containing qualitative and quantitative data integration (mixed-methods) and carrying out phase research from qualitative to quantitative study in an iterative way. Both phases of the research fed into each other and additionally, the iterative process allowed findings from one phase to be validated in the second phase of the research. The new findings and themes from the second phase of the research were validated by feeding into the case study through constant interaction with case participants. This research did not use any existing theory or model and employed critical realism with systematic combining, abduction, as an underpinning philosophy for thematic analysis. It is believed that this kind of approach and methodology has not been applied on this particular topic in past.
- Strategic carbon management process was focused on whole organisation as part of the case study. This looked into direct and indirect sources of carbon emissions, scope 1, 2 and 3 and understood stakeholders' perspective within the organisation. The case study included understanding the perspective and approach of senior management to gain top level view on SCM in wider strategic management and decision-making process. Successes and challenges of a particular university are explored for other organisations to learn.

9.5. Limitations of the research

This section discusses the main research limitations. This research area is not deep rooted within the academic research. However, the literature on wider sustainability and environmental management is relatively established in organisational and university context, as mentioned in Chapter 3. As this is a relatively new area of research with a broad background literature around sustainability, it was difficult to focus the thesis. The second phase of this research was aimed to further explore, validate and modify the findings generated by the first phase. This was achieved through the application of

thematic framework for SCM. In the first phase, 18 semi-structured interviews were conducted at middle management and directorate level. It was difficult to engage senior managers, who are part of senior management team, from these universities and are involved in strategic decision-making. However, it is recognised that the interviews with senior managers could give broader strategic perspective within universities. Getting senior management for interviews from other universities was a challenge. It could be because of the nature of strategic role within universities. The second phase of the research consisted of a survey and DMU case study. In the case study, members of the senior management team, the Executive Board, were interviewed to gain strategic insights. However, the survey respondents are solely individuals from estates and sustainability teams. Given the strategic importance of carbon management, board level senior managers would be required to complete the survey, so future research would benefit input from senior managers such as, VCs, Pro Vice Chancellors and Finance Directors.

Within the case study, an attempt was made to carry out interviews with all of the relevant stakeholders and departments who could have links with the SCM process within the university. The DMU case study offered an opportunity to speak to senior managers representing the executive board. However, academic staff and student population is weakly represented in this study. This could be because of their limited knowledge and interest, as found in the case analysis. The observation of the SDTF meetings and the discussions with the DSU and the NUS representatives were beneficial to gain insights. The case study might not be generalizable to other universities and public sector, but this illustrates the learning for other universities in their own context. However, generalisation may be possible as a result of triangulating different methods of data collection, including the case study data used to generate the framework. This research wanted to carry out an in-depth analysis of a best practice case study, but no comprehensive best practice case was identified which could give access to the researcher and meet the requirements of resources. Consequently, a typical case of DMU was chosen to reflect on SCM practices and its successes and failures. It was not possible for this research to conduct survey of other public sector bodies for comparison due to lack of time and resources. Moreover, it was beyond the scope of the research. However, a quantitative survey of whole of the public sector could provide useful insights into the carbon management process of other public bodies and provide comparative analysis and could illustrate which public sector body is leading the way in the public sector.

9.6. Recommendations for future research work

This section presents the recommendations for future research to be undertaken arising from this research.

- The study has provided academics, practitioners and policymakers with the critical factors that influence the process of strategic carbon management in universities. Further research is

required to evaluate and question these factors in universities as well as other public sector organisations. The proposed framework for SCM can be applied in great depth in universities and also other public sector organisations. This could establish if the HE focused framework is valid to improve and embed SCM in other public sector organisations. Similarly, this can also be applied and tested in other large business organisations.

- The research did not apply any theoretical model or conceptual framework from the theory, rather framework was developed from the data. The future work can take any existing carbon management model or frameworks designed for any other sector or industry and apply it in the context of HE sector to see if it is valid.
- This study could be replicated to other public sector organisations, particularly local authorities and NHS. This could provide comparison among sector organisations and offer cross-sector lessons and learning. The study identified and ranked the drivers and barriers for strategic carbon management in universities, which can be tested for other public sector organisations to establish if public sector organisations are finding similar challenges.
- It would be interesting to conduct the similar quantitative survey of the HE sector again in five to ten years' time to observe change. The DMU case study can also be replicated in few years' time by applying the same thematic framework and establish the change in strategic priorities. Further research suggests comparative case study of DMU with any other university to explore where DMU stands as compared to other universities. This may be a comparative analysis with a best practice university.
- Findings suggested that carbon management is still an afterthought in universities. Future research needs to understand how carbon management can be more successfully mainstreamed within organisations in the current HE climate and senior management leadership can be effectively engaged to integrate it within strategic management and decision-making processes. Further in-depth research is needed for understanding the characteristics of senior management commitment, which was found as one of the CSFs.
- Little evidence is available on carbon management in procurement and supply chain and further research could investigate how procurement departments can effectively embed carbon management into their procedures and decision-making, although this research has taken their perspective in a case study. There is need to conduct research that could come up with a standardised methodology to calculate procurement and other scope 3 emissions and help managing them effectively. This came up as a barrier for scope 3 carbon management in universities. Improved understanding of data management and footprinting methodology appear to be of increasing importance as per the findings of this research. Therefore, further research could support the practitioners and policymakers.

- This study carried out critical review of the global, national and HE sector policies related to carbon management. It has reflected on some of the gaps and issues associated with the policies. Further research could carry out quantitative evaluation of HE sector carbon management policies to calculate the change in carbon emissions since the policies have been introduced and their impact.

9.7. Concluding remarks

This research is a timely and unique piece of research, relevant to HE, public and other sectors. The study aimed at improving the knowledge and developing deeper understanding of SCM by exploring the current state, drivers and barriers and the critical success factors to embed it within universities and beyond. The findings have provided practitioners with learning, support and guidance concerning the strategic and integrative process required to improve the SCM process at whole organisation level. The crucial aspect of this research is that it contributes a necessary piece in the SCM debate for climate change mitigation which is one of the greatest challenges for mankind. This study can be valuable for UK and global universities in their efforts to reduce carbon emissions and respond to climate change. The research has raised a range of issues, which national policymakers (including the public and the HE sector) and global policymakers and leaders can take up to support universities not only with overly ambitious pledges, but through developing mechanisms of real actions.

The study concludes that the changes in the HE funding regime, removing cap on student recruitment and weakening of policies have serious implications for carbon management in the UK HE sector. The current legislations and policy framework have less impact on universities. UK leaving the EU as a result of referendum may also have implications for carbon management policies. This is because some of the policies related to carbon management are EU driven (see Chapter 2), unless UK develops its own stringent policies as an alternate. However, this may cause uncertainty. DECC is also abolished after the EU referendum, which has raised many questions on government's leadership role in mitigating climate change. At present, carbon management seems to be declining and its future is uncertain and therefore, there is a need for HE leadership more than ever. Furthermore, the research has implications for wider society outside the boundary of universities whether it is in terms of other organisations learning from it or preparing students as future leaders for carbon management and climate change in the business world. Universities need to lead by example, because if large organisations with knowledge base such as universities, that is home to the most intelligent and forwards thinking minds, where research and innovation is part of core business, still cannot see the strategic importance of carbon management, then there is even less hope for it taking hold outside HE.

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Appendices

Appendix 1: Information sheet

Strategic carbon management within the UK higher education sector

Information Sheet for Research Participants

Dear Sir or Madam,

I am hoping that you will be willing to participate in a study about strategic carbon management within the higher education sector as part of the Living Lab project. If you are happy to be involved, would you please sign the consent form enclosed to this letter. There are two copies of this letter and form so that you can keep one of them for your records.

What is the purpose of the study? The aim of this research is to explore if and how universities are responding to the challenge of climate change by implementing strategic carbon management. The research will analyse the current state of carbon management, drivers for and barriers to strategic carbon management and the critical success factors to improve and embed it within organistaions. At the end, a strategic carbon management framework will be developed for universities and broader public sector organisations.

This research is a part of the Living Lab project at De Montfort University that seeks integration of technology, human behavior and management for energy and carbon reduction. You have been invited to participate in this exploratory interview in the first phase of the research which will help in raising issues to inform more structured study in the second phase of the research.

What does the study involve? The study will consist of semi-structured interviews in the first phase of the research. I would like to contact you to ask whether you are happy for me to interview you in the second phase of the research.

Who is carrying out the study? The study is being carried out by Muhammad Usman Mazhar, a PhD student, from the Institute of Energy and Sustainable Development (IESD) at De Montfort University as part of a PhD program and is being supervised by Dr Richard Bull and Professor Mark Lemon from IESD. The research is funded by De Montfort University.

How will the result be used? All data collected and processed in this study will be handled in compliance with the Data Protection Act 1998. All information will be anonymised and stored in a secure location. Any personal information will only be accessible to the research team and will be held in confidence. The interview will be recorded to ensure that all your comments are captured and will be transcribed. Your name will not appear alongside any of the comments made in the interview.

Any information you supply will be used exclusively for the purpose of our research programme and will not be passed to others or used for any other purpose. Information, if published, will be in aggregated form or associated with a false name if the comments are especially insightful, so that individuals cannot be identified. Participation in this research is completely voluntary and you can withdraw at any time without prejudice or negative consequences.

If you have any queries specifically about Data Protection Issues you may contact Fraser Marshall, Records Manager, Kimberlin Library, De Montfort University, The Gateway, Leicester LE1 9BH, UK Tel: 0116 257 7655, email: fmarshall@dmu.ac.uk.

Yours sincerely,
Muhammad Usman Mazhar

Muhammad U Mazhar Tel: 0116 2551 551 ext. 6848 email: mmazhar@dmu.ac.uk
Dr Richard Bull Tel: 0116 207 8063 email: rbull@dmu.ac.uk
Professor Mark Lemon Tel: 0116 207 8492 email: mlemon@dmu.ac.uk
De Montfort University has established strong ethics policies which control how we conduct interviews, surveys and other research activities, and this project has been reviewed appropriately.

Appendix 2 - Consent Form

Please put a tick or a cross in the relevant boxes

I, _____ [participant's name] agree that this interview material may be used by the research team at De Montfort University [Muhammad Usman Mazhar].	
I have received a copy of the *Information Sheet for Research Participants*, and I have read and understood this.	
I agree that the contents of the interview may be used in a variety of ways throughout the life of the research project and afterwards: in discussion with other researchers, in any ensuing presentations, reports, publications, websites, broadcasts and in teaching.	
Please use this space if you would like to qualify your consent to the use of the interview in any way:	
I agree with the recording of the interview with the help of a digital recording device	
I understand that I can withdraw consent for this interview to be used at any point by contacting any member of the research team.	
I have received a copy of this statement.	

Signature of participant _____ Date _____

Signature of researcher _____ Date _____

Contact information

Muhammad Usman Mazhar
Institute of Energy and Sustainable Development
De Montfort University
Queens Building
The Gateway
Leicester LE1 9BH

Appendix 3: Interview questions asked in the first phase of the research

Interviewee's background

Name:

University:

Position and department within the university:

Education:

Relevant experience:

Carbon management within the higher education sector

What does carbon management mean to you?

What is the university's approach to carbon management?

What are the features/elements of carbon management process within a university?

How successful is the university in managing its carbon emissions? If not, what are the major gaps?

What factors i.e. CSFs do you think are the most important in how the university manages its carbon emissions successfully?

What are the drivers for carbon management in your university?

What are the barriers to carbon management?

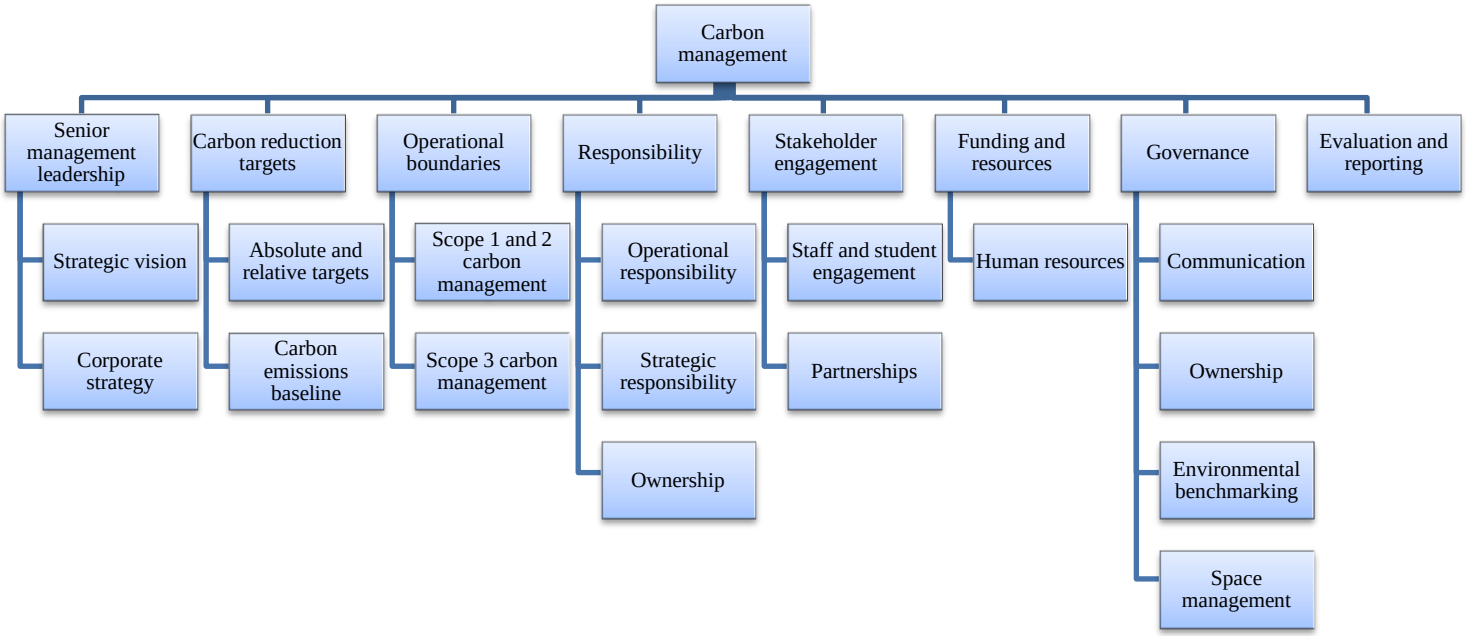
How do you intend to overcome these barriers to carbon management?

Do you see carbon management as a strategic process across the university? If so, then how?

Where do you think the responsibility lies for reducing carbon emissions within the university?

Is there anything more you would like to add on this topic which you think is relevant and has not been covered in the discussion?

Appendix 4: Provisional thematic framework from the content analysis



Appendix 5: Questionnaire survey

Strategic carbon management within the UK higher education sector

1. Introduction

Dear Participant,

My name is Muhammad Usman Mazhar and I am a PhD student at De Montfort University. I would be grateful if you could complete this short questionnaire which should only take around 10 minutes to complete. The doctoral study seeks to understand the current strategic carbon management practices within the UK higher education institutions.

Participation in this study is entirely voluntary and you can withdraw at any time. All of the data collected and processed will be confidential and handled in compliance with the UK Data Protection Act 1998. The data will be stored in a secure location. No personal details will appear on any material (written, oral or otherwise) arising from this research.

Please complete the questionnaire by Friday 27 September, 2013. If you require any further information or assistance on this survey, please contact me:

Yours sincerely,
Muhammad Usman Mazhar
Email: mmazhar@dmu.ac.uk
Mobile: 07971349134
Institute of Energy and Sustainable Development (IESD),
1.05a Queens Building, The Gateway,
De Montfort University, Leicester, LE1 9BH, UK.

2. Background information (Personal information will be kept strictly confidential)

University name: …… **Your name:** ……

Job title: ……. **Department:** …….

Section 1: Strategy Formulation

1. Does your university have a publicly available low carbon or energy policy?

1. Yes 2. Under development 3. No 4. Don't know

Comments (Optional): ……

2. Does your university have a publicly available carbon management plan in place?

1. Yes 2. Under development 3. No 4. Don't know

Comments (Optional):
…….

3. Which of the following policies does your university have? (Please tick all that apply)

1. Environmental policy 2. Sustainability policy 3. Sustainable procurement policy 4. Waste management policy 5. Travel policy 6. Biodiversity policy 7. None 8. Any other (Please mention) …….

Do you have any specific comments about the above policies (Optional):
…….

4. Has your university measured its carbon emissions?

1. Yes 2. In progress 3. No 4. Don't know

If your answer is 'yes' or 'In progress', then which emissions sources* is your university measuring?

1. Scope 1, 2 2. Scope 1, 2, 3 3. Scope 1, 2 and selected scope 3 emissions sources 4. Don't know

If your answer is 3, please mention the selected scope 3 emissions sources?:
……

Comments (Optional):
……

*The World Resource Institute (WRI) classified carbon emissions sources in three 'scopes':

'Scope 1' emissions are direct emissions that occur from sources owned or controlled by the organisation, for example emissions from combustion in owned or controlled boilers/furnaces/vehicles; 'scope 2' accounts for emissions from the generation of purchased electricity consumed by the organisation; 'scope 3' covers all other indirect emissions that are a consequence of the activities of the organisation, but occur from sources not owned or controlled by the organisation – for example, commuting and procurement (HEFCE, 2010b, p. 4). .

5. Has your university set carbon reduction targets?

1. Yes 2. Developing targets 3. No 4. Don't know

If your answer is 'Yes' or 'Developing targets', please state which carbon emissions sources (Scopes 1, 2, 3) are taken into account for these targets? ……..

Also, what type of targets* are these?

1. Absolute targets 2. Relative targets (Per Full Time Equivalent (FTE) student) 3. Relative targets (Per m^2 floor area) 4. Relative targets (Per unit turnover) 5. Don't know 6. Any other business matrix (Please specify) …….

Comments (Optional): ……

*Absolute targets are defined by the GHG Protocol as goals to reduce absolute emissions over a period of time. Relative targets are the goals to reduce the ratio of carbon emissions relative to a certain business metric over a time (WRI and WBCSD, 2004). For example, student numbers, area etc.

6. To what extent do you agree or disagree with the following statements? (Please add comments to clarify, if necessary)

Statements	**Strongly Agree**	**Agree**	**Neither Agree nor Disagree**	**Disagree**	**Strongly Disagree**	**Comments**
Environmental sustainability is integrated into the university's strategic plan/corporate strategy.						
The leadership is fully committed to carbon management agenda of the university.						
The university is aware of the risks associated with carbon emissions.						

The university is aware of the opportunities associated with carbon management.						
The university has robust procedures to monitor energy and fuel consumption data.						
There are effective procedures and knowledge/ information for calculating accurate carbon footprint.						
Carbon management is effectively integrated into the university's procurement process.						
Carbon management is central to the business activities and decision-making of the university.						

Section 2: Strategy Implementation

7. Who has the operational responsibility for implementing carbon management strategies in your university?

Comments (Optional): ……

8. In which of the following areas, has your university developed carbon management strategies? (Please tick that applies and also comment if necessary)

Emissions sources	Yes	No	Don't know	Comments
1. Buildings energy				
2. Own transport fleet				
3. Procurement & supply chain				
4. Waste				
5. Water				
6. Staff and student commute				
7. International				

students' travel				
8. UK students travel				
9. Visitors travel				
10. Business travel				
11. None of the above				

Do you have any other comments on the strategies (Optional):

……

9. To what extent do you agree or disagree with the following statements? (Please add comments to clarify, if necessary)

Statements	**Strongly Agree**	**Agree**	**Neither Agree nor Disagree**	**Disagree**	**Strongly disagree**	**Comments**
Carbon reduction targets, strategies and performance are communicated to all of the relevant stakeholders.						
The university provides sufficient financial and managerial resources for the implementation of carbon management.						
The university has carbon reduction behavioural change and awareness raising programmes in place for staff and students.						
Current organisational structure for implementing carbon management strategies is effective.						
There is a cross-faculty/departmental motivation and ownership of carbon management across the university (i.e. within and between functions and roles)						
The university is utilising the space of its estate effectively with carbon considerations.						
The university is developing strategic partnerships with other stakeholder organisations for carbon management.						

Section 3: Strategy Evaluation

10. To what extent do you agree or disagree with the following statements? (Please add comments to clarify, if necessary)

Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Comments
The university is effectively managing its carbon emissions.						
The university is effectively tracking progress towards its carbon management targets.						
The university's carbon management plan is effective in reducing carbon emissions year on year.						
The university is successfully implementing the carbon reduction projects as planned.						
The university is able to manage the conflicts between carbon management and core business activities/growth**.**						
The university reviews carbon management process regularly and revise its strategic decisions as appropriate.						
The lessons learnt from carbon management reviews are incorporated into the next phase of strategy.						

11. What are the drivers for carbon management in your university? (Please rate as per their importance and also comment, if necessary), 1 = Not important, 5 = Very important

Drivers	1	2	3	4	5	Comments
Climate change						
Do the right thing						
Comply with government laws and regulations						

Higher Education Funding Council (HEFCE) policies and strategies						
Internal organisational policies						
Energy prices						
Financial savings						
Reputation and market position						
Student & staff recruitment and retention						
Provision of healthier and comfortable learning environment						
Respond to pressure from NGOs and other groups						
Respond to criticism in the media						
Aspirational drivers						
University's own Key Performance Indicators (KPIs)						
Any other (Please mention)						

12. What are the barriers to carbon management for your university? (Please rate as per their importance and also comment, if necessary), 1 = Not important, 5 = Very important

Barriers	**1**	**2**	**3**	**4**	**5**	**Comments**
Lack of capital funding						
Lack of time and other resources						
Lack of senior management commitment						
Lack of strong policy framework						
Financial accounting rules within the university						

Growing estate and business						
Complex buildings stock (Historical/listed buildings)						
Priority to core business						
Lack of knowledge and expertise						
Low carbon/energy efficiency market complexity and fragmentation						
Staff and students' resistance to behavioural change.						
Any other (Please mention)						

13. Please add any further comments or suggestions you might have regarding strategic carbon management within universities?

Thank you very much for completing this questionnaire and your input will help explore the current state and performance of carbon management within higher education institutions. Please contact me through the above mentioned details, if you are interested in the research findings.

Appendix 6: Interview questions asked in the second phase case study

1. Questions for members of the senior management team/Executive Board (Deputy Vice Chancellor, Pro Vice-Chancellor)

What does carbon management mean to you as a senior manager at DMU?

Do you think that senior management team, the Executive Board, understands carbon management agenda and its implications for DMU?

Is carbon management a strategic concern for you and the Executive Board?

Do you think that senior management team has bought into carbon management/environment sustainability process at DMU? How do they approach/contribute to it?

Is carbon management (or widely environmental sustainability) being considered into strategic management and decision-making process of the university? If not, then how can it be done?

Where does carbon management stand as compared to the core business?

How do you manage conflicts between the core business activities such as internationalization (for example, DMUglobal), business travel, 24/7 or out of hours opening of facilities and carbon management?

What are the barriers to carbon management for senior management team in DMU? How do you overcome them?

How do you think carbon management can be embedded into the whole organisation?

Who has the strategic responsibility for carbon management at DMU? Who is the senior champion for it?

Any other issue you would like to raise in regards to strategic carbon management?

2. Questions for the Director of Finance

What does carbon management mean to you? How important is it for you, being the Director of Finance at DMU?

In general, how does finance work within DMU?

Is carbon management a concern for you as compared to the core business?

Have you developed low carbon/sustainable procurement and ethical investment policy?

What are the key drivers and barriers for you to implement carbon management?

How do you see HEFCE linking capital funding with carbon management performance?

Have you changed your approach to investing in response to the government's and HEFCE's policies to reduce carbon emissions?

Is finance a barrier to carbon management? If yes, how to overcome it?

How finance is allocated to carbon management projects at DMU?

What is the role of Capex and Opex for carbon management projects at DMU?

Do you think that carbon management/sustainability is embedded into procurement process at DMU?

What are you doing for low carbon procurement at DMU?

Do you think that investment in carbon management will create a business opportunity?

How do you see carbon management in the wider organisational context at DMU?

Is there anything else you would like to add?

3. Questions for the Director of Estates and Commercial Services

What is your role in carbon management at DMU?

Do you think that carbon management is embedded into all of the DMU's estates operations?

How do you see the role of government policies for carbon management?

Do you think that senior executives understand it and they participate in the process at DMU?

Where does carbon management stand as compared to the core business at DMU?

What do you think are the barriers to a strategic approach to carbon management at DMU?

Who has an overall responsibility for carbon management at DMU?

How do you manage estates growth with carbon management?

Anything else you would like to highlight around carbon management at DMU?

4. Questions for the ITMS and POD/HR directorates

Do you think that the department fully understands carbon management?

Do you consider carbon management in ICT/POD operations?

How ICT/POD is contributing to DMU's carbon management commitments?

How energy efficient DMU's ICT estate is (for ITMS only)?

Do you keep carbon management into considerations while procuring ICT equipment (for ITMS)?

Do you think that the ITMS not paying the energy bills is cause of lack of ownership?

Is carbon management a part of job descriptions and roles in recruitment at DMU (for HR only)?

Is carbon management or environmental sustainability part of HR strategy?

What are the key barriers to implement carbon management in ICT/POD operations?

How are you overcoming these barriers?

Have you developed green ICT strategy (for ITMS only)?

5. Interview questions for the Marketing and Communications Directorate

What does carbon management mean to you?

What is the role of communications in carbon management/environmental sustainability at DMU?

Do you/your department feel involved in carbon management process at DMU?

What are the communication issues/barriers around carbon management and environmental sustainability at DMU?

Are you working in collaboration with the IESD and the Estate Department to communicate the environmental/carbon messages and profile to all of the stakeholders as it came out of SDTF meetings?

Which forms of communications are currently being used within DMU?

How can DMU communicate its carbon management program effectively?

Is there anything else you would like to highlight?

Appendix 7: Sustainability declarations and carbon management (Chapter 2)

Global sustainability declarations

The United Nations Conference on Environment and Development (UNCED) (Rio Earth Summit) was the outcome of the WCED report in 1992. The world leaders discussed sustainable development and the 'Agenda 21' was the result of the Rio Summit. This is a detailed action plan for the UN planning process for a sustainable future. The Kyoto Climate Agreement was signed to protect the atmosphere and natural climate. At the 2002 World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa, sustainable development was reaffirmed as a central theme of international agenda (UN, 2002). WSSD gathered a large number of heads of state, leaders from businesses and non-governmental organisations, 10 years after the first Earth Summit in Rio de Janeiro, Brazil. Therefore, it is known"Rio+10". An attempt to define 'sustainable university' was made at the Talloires Declaration (TD) by HE leaders in 1990 in Talloires, France. This was the first official statement made by university senior administrators to commit to environmental sustainability agenda. The TD produced a ten-point action plan for incorporating sustainability and environment in research, teaching, operations and outreach at universities globally. It was signed by over 350 university presidents and chancellors from 40 countries (University Leaders For A Sustainable Future, 2001). These declarations aimed to establish a link between sustainability and universities, because HE can serve as a model of sustainability by integrating sustainability in all aspects of campus life (Cortese, 2003). There have been many international declarations to embed sustainability in universities in the last two decades. The movement to promote sustainability in HE gained momentum in 1990s, after the Kyoto Agreement in 1997 in Japan. Table 76 indicates that carbon management has not been a central theme in these declarations. Later, the language seems to be changed from environmental sustainability and sustainable development to carbon management due to international and national carbon reduction targets.

Year	Declaration/Charter	Key words/themes
1972	The Stockholm Declaration on the Human Environment, UN Conference on the Human Environment, Sweden	Made reference to sustainability in HE in an indirect way. Human-centred focus and recognised the interdependency of humanity and environment
1975	The Belgrade Charter, Belgrade Conference on Environmental Education, Yugoslavia	Acknowledged the importance of environmental education and the role of HE to progress the global environmental agenda
1977	Tbilisi Declaration, Intergovernmental Conference on Environmental Education, Georgia	Formal starting point of environmental education and echoed the Stockholm Declaration. Encouraged universities to consider environmental and sustainability in university framework through holistic appraoches
1987	'Our Common Future', The Brundtland Report	Common concerns and role of international economy for sustainable development; Key challenges ahead; Common endeavours
1990	Talloires Declaration, Presidents Conference,	The first statement of university leaders to commit to

	France	sustainability. Unprecedented scale and speed of pollution and degradation. Major roles: education, research, policy, information exchange
1991	Halifax Declaration, Conference on University Action for Sustainable Development, Canada	Responsibility to shape present and future development; Ethical obligation; Overcome root causes
1993	Kyoto Declaration on Sustainable Development	Better communication of the what and why of sustainable development (SD); Teaching and research; Operations to reflect SD best practices
1993	Swansea Declaration	Educational, research and public service roles; Major attitudinal and policy changes
1994	Copernicus University Charter for Sustainable Development	Institutional commitment; Environmental ethics and attitudes; Education of employees; Environmental education; Interdisciplinary; Dissemination of knowledge; Networking; Partnerships; Continuing education programmes; Technology transfer
2001	Lüneburg Declaration	Catalyst for SD building a learning society; Generate new knowledge to train leaders and teachers of tomorrow; Disseminate state of the art knowledge; Continually review and update curriculum
2002	Unbuntu Declaration	Creation of a global learning environment for ESD; to produce a tool kit designed to move from commitment to action; Strategies for implementing SD; particularly in teaching, research, operations and outreach; and offer best practice
2005	Graz Declaration on Committing Universities to Sustainable Development, Austria	Called on universities to give value to SD in strategies and activities. It called for universities to use SD as a framework for the enhancement of the social dimension of European HE
2005	Bergen Declaration	A strong reference that the Bologna Process for establishing a European HE Area by 2010 and promoting the European system of HE worldwide should be based on the principle of SD
2006	American College and University Presidents' Climate Commitment (ACUPCC)	Called for an emissions inventory; Within two years, universities are to set a date for becoming 'climate neutral'; Integrating sustainability into the curriculum
2008	Declaration of the Regional Conference on Higher Education in Latin America and the Caribbean – Conferencia Regional de Educación Superior (CRES) 2008	Emphasis on SD for social progress; Cultural identities; Social cohesion; Poverty; Climate Change; Energy Crisis; Need contributes to democratic relations and tolerance
2008	Sapporo Sustainability Declaration	Universities should work closely with policymakers; Universities' leadership role is becoming increasingly critical; Educating; Training leaders; Interdisciplinary perspective
2009	World Conference on Higher Education	Advance understanding of multifaceted issues and response; Increase interdisciplinary focus and critical thinking; Active citizenship, Wellbeing, Contribute to education for ethical citizens
2009	Turin Declaration on Education and Research for Sustainable and Responsible Development, Italy	New models of social and economic development; Ethical approaches to SD; New approaches to energy policy; Focus on sustainable ecosystems
2010	Learning for Change: Scotland's Action Plan for the Second Half of the UN Decade of	Action plan to respond to the UNDESD. In HE sector, the Scottish Government has set up specific recommendations

	Education for Sustainable Development (UNDESD)	for universities to advance sustainability
2010	Network of Universities from the Capitals of Europe (UNICA) Green Academic Footprint Pledge	Emphasised the unique position of universities at the different capitals of Europe
2012	Rio+20 United Nations Conference on Sustainable Development	Green economy in the context of sustainable development; Poverty eradication; Institutional framework for sustainable development

Table 76: Global sustainability declarations, Adapted and updated from (Lozano et al., 2013), (Tilbury, 2011) and (Wright, 2002)

The conference, Rio+20, held in Rio de Janeiro, Brazil in June 2012 was the biggest UN conference and its outcome document was titled as 'The future we want'. It recognises the significance of sustainable development 'education at all levels'. It encourages HEIs to implement good practice and teach and research sustainable development across all disciplines (HEFCE, 2013a). Grindsted and Holm (2012) argue that 'Sustainable campus operations' is not a new theme in sustainability declarations and it was made explicit in the Talloires Declaration in 1990, Swansea in 1993 and Kyoto Declarations in 1993. 'CO_2 reduction' is introduced as a theme in recent sustainability declarations, but these declarations do not specify any targets, standards or any precise definition about what sustainable campus operations means (Grindsted and Holm, 2012). Such operations have been given a low priority in majority of the sustainability declarations (Wright, 2004). Table 77 classifies the declarations into three categories. The first category refers to the declarations mentioning neither CO_2 emissions nor climate change; the second mentions CO_2 emissions and climate change only as a society's problem and the third category covers declarations specifically dealing with CO_2 reduction (Grindsted and Holm, 2012).

Declarations not mentioning CO_2 emissions	Stockholm 1972*, Tbilisi 1977*, Halifax 1991, Agenda 21 1992*, Swansea 1993, IAU Kyoto 1993, Copernicus 1994, Thessaloniki 1997*, World declaration on Higher Education 1998*, Charter of the Netherlands Universities 1999, Lüneburg 2001*, Ubuntu 2002*, Cape Town 2002*, Barcelona 2004, Graz 2005*, Declaration on the Responsibility of Higher Education 2006*, Charter for an Alliance of French Universities 2008, Tokyo 2009*
Declarations mentioning CO_2 emissions as a social problem that might be included in curricula	Talloires 1990, Lucerne Declaration 2007, Sapporo 2008, Bonn Declaration 2009*, Lübeck Declaration 2009*
Declarations specifically mentioning CO2 emissions in research, education, and/or campus operations	ACUPCC 2007, AAU Resolution on Green Energy 2009, ISCN/GULF Charter 2010

Note: * Made by intergovernmental/governmental institutions.

Table 77[14]: Sustainability declarations and CO_2 emissions (Grindsted and Holm, 2012)

[14] Abbreviations used in Table 77; ACUPCC – American College and University Presidents' Climate Commitment, AAU – Association of American Universities, ISCN – International Sustainable Campus Network, GULF – Global University Leaders Forum

These declarations helped shape the EU, national and local climate policies. HE declarations on sustainability have grown over the last two decades or so (Grindsted and Holm, 2012) and have provided a clear commitment to encourage progress, but they are not enough to change institutional practices (Bekessy et al., 2007). There is a need to understand how these policies can be transformed into effective implementation, because the signing of declarations does not necessarily translate into implementation (Bekessy et al., 2007). Sustainability in HE has been a major concern for a number of years (Ok, 2012) and the HEFCE has been trying to advise the sector in England through its policies and strategies.

Appendix 8: Demographic information of the survey (Chapter 5)

Demographic information

The first optional section of the survey asked for demographic information, notably the respondents' name, university, department and job title. The potential respondents were assured about the confidentiality of personal details and information provided. The majority of the respondents completed this section, but there were fourteen respondents who did not do so for some reasons.

Responding universities

The majority of the respondents (113 out of 126) disclosed the name of their university and 13 respondents did not mention university's name for some unknown reason. It could be because of confidentiality of the data. If all of the respondents would have mentioned the name of university, it might have increased the total number of responding universities, which are currently 68. It would be difficult to mention names of all responding universities. Therefore, number of universities from the four constituent parts of the UK is presented below.

England	Scotland	Wales	Northern Ireland	Total
59	7	2	0	68

Table 78: Distribution of the respondent universities

Table 78 indicates that there is representation from universities in England, Scotland and Wales. Many of the universities form part of one or more groups or coalitions of UK universities. The main groups are the Red Brick or Civic universities, the Plate Glass or 1960s universities, the Russell Group and new universities or post-1992 group. These groups exist to protect the interests of their universities. Civic universities are referred to as 'red brick' universities and were founded in the 19th century due to increasing need for university level education. Red Brick universities are part of Russell Group now. Plate Glass refers to the universities founded between 1963 and 1992 (mainly in the 1960s) as part of the education reforms in the UK (The Student Room, 2014). Russell Group of universities represent 24 leading universities committed to excellence in research, teaching and

learning experience for students and collaborations with businesses and the public sector (Russell Group, 2015). New or post-1992 universities are mainly former polytechnics (some were not polytechnics) or further education colleges that were granted full university status as part of the same education reforms. Most of the post-1992 universities have elements that go back several hundred years, but their degree awarding status may be new. Their establishment is often older than some of the Civic and Red Brick universities (The Student Room, 2014). In this study, universities are divided in two categories based on the year of foundation, pre-1992 and post-1992. Any institution that received the status of a university before 1992 is in the pre-1992 group (including Red Brick and Russell Group universities). The institutions becoming universities in or after 1992 are categorised in post-1992 group.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pre-1992	55	43.7	48.7	48.7
	Post-1992	58	46.0	51.3	100.0
	Total	113	89.7	100.0	
Missing	System	13	10.3		
Total		126	100.0		

Table 79: Groups of the UK universities

Table 79 gives the percentage distribution of the responses from both pre-1992 (48.7%) and post-1992 (51.3%) universities. 55 responses from pre-1992 universities included 26 responses from Russell Group universities. This could mean that the sample is representative in the survey. As 13 respondents did not mention the name of university, so their group affiliation is unknown.

Job titles of the respondents

The majority of the respondents, 112 out of 126, mentioned job titles. The survey respondents were from different backgrounds and there were a broad range of job titles which exist in universities. People might be doing the same job but they have different job titles. A wide range of respondents were helpful to investigate the real situation of SCM in different areas of emissions. The directors and deputy directors to environmental/sustainability/energy/carbon managers completed the survey. Predominantly, middle managers including energy managers, sustainability managers, environmental managers and estates/facilities managers were the respondents (Figure 34). This suggests that job titles vary in universities and universities have different job titles for individuals involved in carbon management. In order to visualise the job titles of the respondents, the word cloud is produced.

Figure 34: Word cloud of job titles

Some universities have a specific role of head of environment and energy or head of sustainability to oversee the environmental sustainability process. Some of the respondents from other university departments also completed the survey such as finance and procurement. In addition, some academics and students completed the survey. There were 14 respondents who did not mention their job titles in order to be anonymous.

Names of departments

The last question was to investigate the university department, where the survey respondents work. All of the 126 respondents included the names of their department. The majority of the respondents (88) were from the estates and facilities management departments and environmental sustainability and carbon management are part of it in majority of the universities. There were 9 respondents particularly from environmental sustainability related department, where this unit works as a separate entity. There were 8 respondents from academic departments and 4 from finance and procurement directorates. The academics also included 2 students studying the environment relevant degrees. It was found that universities have named environment related departments differently, but the nature of work remains same. This suggests that there is no consistency in how roles and departments work in universities and they work in different ways. In one university, the department of procurement and sustainability work together and appear to be integrated with each other, which is uncommon in the HE sector. There was one respondent who sits in the VC office and none of other universities has similar structure. This action may bring carbon management on the VC and strategic agenda.

Estates & facilities	Environmental sustainability	Academic department	Procurement & finance	Vice Chancellor office	No information	Total
88	9	8	4	1	16	126

Table 80: Types of university departments

A word cloud is produced to give representation of the key departments where the respondents are based in. Estates, facilities and environmental sustainability departments can be noticed in Figure 35.

Figure 35: Word cloud of university departments

Appendix 9: Statistical tests of the survey data (Chapter 5 and 6)

Statistical tests

This section presents the statistical tests performed as part of Chapter 5 and 6. Statistical tests rely on parametric assumptions. If the data are not normally distributed, then non-parametric statistical tests are adopted. These are also called as assumptions-free tests, because they make less assumptions about the data on which they can be applied (Field, 2009). The data was first tested for the statistical assumptions and it was found that many of the variables do not meet the assumption of normal distribution. Hence, the current study followed non-parametric assumptions for the tests. Non-parametric statistics have been used because the data are mainly categorical and ranked. If the measurement scale is nominal or ordinal, then it is advised to use non-parametric statistics. Five Likert scale data are ordinal. This is supported by Pallant (2007) who indicates that some of the statistics (for instance mean and Std) are not appropriate in case of a categorical variable (ordinal/ nominal). However, non-parametric tests are less powerful than the parametric (Pallant, 2007), but Field (2009) believe that this is not always true and they are not to be looked down on.

Correlation analysis

This section presents correlation analysis between the key variables related to SCM. Correlations help in exploring the relationship between two variables and the direction. Based on non-parametric assumptions, Spearman's rho correlation coefficients were calculated. Correlations determine whether any of the variables are associated with other variables and how they affect each other during the SCM process. Table 81 presents correlations between the selected variables. Only the key variables are discussed here, as it may not be appropriate to report all of the correlation coefficients and they are presented in a table (Pallant, 2007).

			Corporate strategy	Senior management leadership	Strategic decision-making	Communication	Resources	Behaviour change	Cross faculty/departmental ownership	Effectiveness of carbon management
Spearman's rho	Corporate strategy	Correlation Coefficient	1.000	.607**	.527**	.380**	.425**	.463**	.506**	.443**
		Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000
		N	115	114	114	112	111	112	112	112
	Senior management leadership	Correlation Coefficient	.607**	1.000	.630**	.415**	.654**	.485**	.531**	.578**
		Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000
		N	114	114	113	111	110	111	111	111
	Strategic decision-making	Correlation Coefficient	.527**	.630**	1.000	.277**	.501**	.425**	.567**	.535**
		Sig. (2-tailed)	.000	.000	.	.003	.000	.000	.000	.000
		N	114	113	114	111	110	111	111	111
	Communication	Correlation Coefficient	.380**	.415**	.277**	1.000	.317**	.448**	.447**	.589**
		Sig. (2-tailed)	.000	.000	.003	.	.001	.000	.000	.000
		N	112	111	111	112	111	112	112	112
	Resources	Correlation Coefficient	.425**	.654**	.501**	.317**	1.000	.478**	.447**	.590**
		Sig. (2-tailed)	.000	.000	.000	.001	.	.000	.000	.000
		N	111	110	110	111	111	111	111	111
	Behaviour change	Correlation Coefficient	.463**	.485**	.425**	.448**	.478**	1.000	.471**	.463**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000
		N	112	111	111	112	111	112	112	112
	Cross faculty/departmental ownership	Correlation Coefficient	.506**	.531**	.567**	.447**	.447**	.471**	1.000	.567**
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000
		N	112	111	111	112	111	112	112	112
	Effectiveness of carbon management	Correlation Coefficient	.443**	.578**	.535**	.589**	.590**	.463**	.567**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.
		N	112	111	111	112	111	112	112	112

**. Correlation is significant at the 0.01 level (2-tailed).

Table 81: Correlations analysis between variables

The correlation between senior management leadership and existence of environmental sustainability or carbon management into corporate strategy was calculated. It can be seen from the Spearman's rho correlation coefficient in Table 81 that there is a strong correlation (p=.607) between these two variables. The p-value for 2-tailed significance is .000, rounded to three decimal places. Because the significance p <.05, so the null hypothesis is rejected, which was, there is no relationship between senior management leadership and corporate strategy. Thus, it can be concluded that there is a significant relationship between both the variables. Positive coefficient indicates a direct relationship, that is, when one variable increases, the other increases and vice versa. This suggests that universities having strong leadership have environmental sustainability at the heart of their corporate strategy. Thus, senior leadership is needed for embedding carbon management into corporate strategy.

The two variables, corporate strategy and strategic decision-making, were correlated to investigate if corporate strategy could impact strategic decision making for carbon management. There has been found strong positive relationship (p=.527) between these variables. The p-value for 2-tailed significance is .000 and the significance value p <.05, so the null hypothesis is rejected. This indicates that university having environmental sustainability as part of their corporate strategy are more likely to consider carbon management into their strategic decision-making process. This will have implications for financial and managerial resources to implement carbon management strategies and embedding carbon management into the organisation. Similarly, there is medium level of positive correlation between corporate strategy and financial and managerial resources within universities (p=.425). In this case, the p-value for 2-tailed significance is .000 and the significance value p <.05, so the null hypothesis is rejected and the relationship exists between them.

Cross faculty and departmental motivation and ownership appears to be the key for embedding carbon management. The correlation analysis between corporate strategy and cross faculty/departmental motivation and ownership shows that there is a strong relationship (p=.506) between the two variables. The p-value for 2-tailed significance is .000 and p <.05, so the null hypothesis, there is no relationship between these variables, is rejected. Thus, universities having environmental sustainability (and carbon management) within their corporate strategies are likely to have faculty and departmental motivation and ownership across the university. This could be within and between the functions and roles. Examining Table 81 reveals that universities having environmentally conscious corporate strategy are more likely to be effective in reducing their carbon emissions (p=0.443). This suggests strategic influence of corporate strategy within organisations.

The correlation between senior management leadership and commitment of financial & managerial resources was calculated. It can be noticed from the Spearman's rho coefficient in the table above that there is strong positive correlation (p=.654) between leadership and resources. The p-value for 2-tailed significance is .000 and is rounded to three decimal places. As the significance value p <.05, null hypothesis is rejected. It is concluded that significant positive relationship exists between these

variables. The correlation analysis indicates that if senior leadership of universities is committed and bought into the SCM process, they are more likely to provide the required financial and managerial resources for implementing strategies; otherwise middle managers may struggle to secure funding and resources for projects. Furthermore, p=0.630 reveals strong positive relationship between leadership and consideration of carbon management into business activities and decision-making. Committed leadership is likely to make strategic decisions with carbon management considerations.

Leadership is integral for the effectiveness of carbon management. The Spearman correlation coefficient of 0.578 in the table above shows strong positive relationship between senior management commitment towards carbon management agenda and its effectiveness within universities. As $p<0.05$, so the null hypothesis is rejected. Furthermore, the table shows the link between the overall effectiveness of carbon management and consideration of carbon management into strategic decision-making in universities. The Spearman correlation coefficient is calculated as .535 which proves significant positive correlation between the overall effectiveness of carbon management and integration of carbon management into decision-making. The more universities' senior management consider carbon emissions into their decision-making, the more effective carbon reductions could be in universities.

The variable, communication, is correlated with both 'cross faculty and departmental motivation and ownership' and 'effectiveness of carbon management'. The value p=0.447 indicates that communication is positively related to cross faculty/departmental motivation and ownership and the strength of the relationship is medium. The p-value for 2-tailed significance is .000, rounded to three decimal places and the significance value is $p <.05$, so the null hypothesis is rejected revealing this relationship. As shown in the table, communication of carbon reduction targets, strategies and performance to the stakeholders could help effectively managing carbon emissions. This is proved with the help of p=0.589 with p-value for 2-tailed significance .000 and rounding to three decimal places. The significance value $p <.05$ rejects the null hypothesis. There is a significant positive and strong correlation between the availability of financial and managerial resources and effectiveness of reducing emissions (p= .590, p=0.01, two tailed). This correlation dictates that more resources would help effective management of carbon emissions. This complements the findings of the first phase. Most of the correlations show that the variables are related to each other. This indicates that they are important contributor towards effective SCM process in universities. Interestingly, it is noticeable from the table that only one correlation was found 'weak' which is between communication and strategic decision-making (p=0.277).

Group differences

The responding universities were categorised into two groups. These are pre-1992 and post-1992 groups of universities. There were 55 pre-1992 universities (48.7%) and 58 post-1992 universities (51.3%) (see Table 79). 13 of the respondents did not mention the names of universities, so it will not be possible to categorise them in any of the groups. Mann-Whitney U Test was performed to explore the difference between the two groups. This method is used to test the differences between the two independent groups on a continuous measure (Pallant, 2007). This test can be performed on ordinal (ranked) data while assuming non-parametric assumptions. Variables were chosen from the Likert Scale questions in the survey to perform the Mann-Whitney U Test and the following tables were produced.

Mann-Whitney U Test

Ranks				
	University Group	N	Mean Rank	Sum of Ranks
Corporate strategy	Pre-1992	52	51.61	2683.50
	Post-1992	56	57.19	3202.50
	Total	108		
Senior management leadership	Pre-1992	52	53.05	2758.50
	Post-1992	55	54.90	3019.50
	Total	107		
Risks	Pre-1992	52	56.39	2932.50
	Post-1992	56	52.74	2953.50
	Total	108		
Opportunities	Pre-1992	52	55.09	2864.50
	Post-1992	56	53.96	3021.50
	Total	108		
Decision making	Pre-1992	52	56.77	2952.00
	Post-1992	56	52.39	2934.00
	Total	108		
Resources	Pre-1992	51	55.83	2847.50
	Post-1992	54	50.32	2717.50
	Total	105		
Cross faculty/departmental ownership	Pre-1992	52	52.89	2750.50
	Post-1992	54	54.08	2920.50
	Total	106		
Effectiveness of carbon management	Pre-1992	52	50.97	2650.50
	Post-1992	54	55.94	3020.50
	Total	106		
Effectiveness of carbon management plan (CMP)	Pre-1992	52	53.07	2759.50
	Post-1992	54	53.92	2911.50
	Total	106		
Conflicts management	Pre-1992	52	53.79	2797.00
	Post-1992	54	53.22	2874.00
	Total	106		

Test Statistics[a]										
	Corporate strategy	Leadership	Risks	Opportunities	Decision making	Resources	Cross faculty/departmental ownership	Effectiveness of CM	Effectiveness of CMP	Conflicts management
Mann-Whitney U	1305.500	1380.500	1357.500	1425.500	1338.000	1232.500	1372.500	1272.500	1381.500	1389.000
Wilcoxon W	2683.500	2758.500	2953.500	3021.500	2934.000	2717.500	2750.500	2650.500	2759.500	2874.000
Z	-.998	-.341	-.682	-.203	-.758	-.981	-.209	-.910	-.155	-.099
Asymp. Sig. (2-tailed)	.318	.733	.495	.839	.448	.327	.835	.363	.877	.921
a. Grouping Variable: University Group										

Some of the key variables are compared for both pre-1992 and post-1992 groups of universities. It is noticeable from the table 'Test Statistics' that the Z value and significance level is given as Asymp. Sig (2-tailed). In 'Test Statistics' table, the significance value (p) of each variable is not less than or equal to 0.05, therefore the result is not significant. A Mann-Whitney U Test revealed no significance difference in all of the variables for both pre-1992 and post-1992 universities.

Mean

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Corporate strategy * University Group	108	85.7%	18	14.3%	126	100.0%
Leadership * University Group	107	84.9%	19	15.1%	126	100.0%
Risks * University Group	108	85.7%	18	14.3%	126	100.0%
Opportunities * University Group	108	85.7%	18	14.3%	126	100.0%
Decision making * University Group	108	85.7%	18	14.3%	126	100.0%
Resources * University Group	105	83.3%	21	16.7%	126	100.0%
Cross faculty/departmental ownership * University Group	106	84.1%	20	15.9%	126	100.0%
Effectiveness of CM * University Group	106	84.1%	20	15.9%	126	100.0%
Effectiveness of CMP * University Group	106	84.1%	20	15.9%	126	100.0%
Conflicts management * University Group	106	84.1%	20	15.9%	126	100.0%

Report										
Median										
University Group	Corporate strategy	Leadership	Risks	Opportunities	Decision making	Resources	Cross faculty/departmental ownership	Effectiveness of CM	Effectiveness of CMP	Conflicts management
Pre-1992	4.00	4.00	4.00	4.00	3.00	4.00	3.00	4.00	4.00	3.00
Post-1992	4.00	4.00	4.00	4.00	3.00	3.00	3.00	4.00	4.00	3.00
Total	4.00	4.00	4.00	4.00	3.00	4.00	3.00	4.00	4.00	3.00

When presenting the results, it is better to report the median values of each group (Pallant, 2007). The median score of each group was calculated with SPSS and 'Case Processing Summary' and 'Report' tables were produced. 'Case Processing Summary' gives the percentages of the respondents who answered this question. The 'Report' table depicts that medians of each variable for both groups are

same (3 or 4), apart from ‘Resources’. This suggests that strategic carbon management related issues are almost same within universities belonging to both groups.

Group differences of drivers

Mann-Whitney U Test was carried out to find differences of drivers for carbon management between pre-1992 and post-1992 groups. This test investigated how the two groups of universities perceive the drivers according to their level of importance. The test produced the following tables. In ‘Ranks’ table, ‘Mean Rank’ values are presented and ‘Test Statistics’ table gives ‘Z’ and significance values for each variable. The procedure of obtaining median score produces ‘Case Processing Summary’ and ‘Report’ tables. However, ‘Effect size’ is not calculated in this chapter for each variable because of the scope of the analysis.

Ranks				
	University Group	N	Mean Rank	Sum of Ranks
Climate Change	Pre-1992	52	51.68	2687.50
	Post-1992	53	54.29	2877.50
	Total	105		
Do the Right Thing	Pre-1992	52	51.27	2666.00
	Post-1992	53	54.70	2899.00
	Total	105		
Laws and Legislations	Pre-1992	51	53.23	2714.50
	Post-1992	54	52.79	2850.50
	Total	105		
HEFCE	Pre-1992	52	51.43	2674.50
	Post-1992	54	55.49	2996.50
	Total	106		
Organisational Policies	Pre-1992	51	52.44	2674.50
	Post-1992	53	52.56	2785.50
	Total	104		
Energy Prices	Pre-1992	52	53.87	2801.00
	Post-1992	54	53.15	2870.00
	Total	106		
Financial Savings	Pre-1992	52	52.76	2743.50
	Post-1992	54	54.21	2927.50
	Total	106		
Reputation and Market Position	Pre-1992	52	49.44	2571.00
	Post-1992	52	55.56	2889.00
	Total	104		
Staff and Students Recruitment	Pre-1992	52	52.30	2719.50
	Post-1992	52	52.70	2740.50
	Total	104		
Healthier and Comfortable Environment	Pre-1992	52	52.91	2751.50
	Post-1992	53	53.08	2813.50
	Total	105		
Pressure from NGOs	Pre-1992	52	50.86	2644.50
	Post-1992	52	54.14	2815.50
	Total	104		
Media criticism	Pre-1992	52	56.44	2935.00
	Post-1992	52	48.56	2525.00
	Total	104		

Aspirational drivers	Pre-1992	51	50.05	2552.50
	Post-1992	53	54.86	2907.50
	Total	104		
KPIs	Pre-1992	51	44.35	2262.00
	Post-1992	54	61.17	3303.00
	Total	105		

Test Statistics[a]

	Climate Change	Do the Right Thing	Laws and Legislations	HEFCE	Organisational Policies	Energy Prices	Financial Savings	Reputation and Market Position	Staff and Students Recruitment	Healthier and Comfortable Environment	Pressure from NGOs	Media Criticism	Aspirational Drivers	KPIs
Mann-Whitney U	1309.500	1288.000	1365.500	1296.500	1348.500	1385.000	1365.500	1193.000	1341.500	1373.500	1266.500	1147.000	1226.500	936.000
Wilcoxon W	2687.500	2666.000	2850.500	2674.500	2674.500	2870.000	2743.500	2571.000	2719.500	2751.500	2644.500	2525.000	2552.500	2262.000
Z	-.454	-.601	-.081	-.726	-.020	-.131	-.274	-1.089	-.071	-.030	-.579	-1.386	-.839	-2.910
Asymp. Sig. (2-tailed)	.650	.548	.936	.468	.984	.896	.784	.276	.944	.976	.562	.166	.402	.004

a. Grouping Variable: University Group

The above statistics show that there is no evidence to support a difference in the drivers between the two groups. From the table 'Test Statistics', it is noticeable that 'p' values for all the drivers for carbon management are greater than 0.05, which means that there is no statistically significant difference between the two groups against these drivers. All of the drivers are equally important for both the groups.

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Climate Change * University Group	105	83.3%	21	16.7%	126	100.0%
Do the Right Thing * University Group	105	83.3%	21	16.7%	126	100.0%
Laws and Legislations * University Group	105	83.3%	21	16.7%	126	100.0%
HEFCE * University Group	106	84.1%	20	15.9%	126	100.0%
Organisational Policies * University Group	104	82.5%	22	17.5%	126	100.0%
Energy Prices * University Group	106	84.1%	20	15.9%	126	100.0%
Financial Savings * University Group	106	84.1%	20	15.9%	126	100.0%
Reputation and Market Position * University Group	104	82.5%	22	17.5%	126	100.0%
Staff and Students Recruitment * University Group	104	82.5%	22	17.5%	126	100.0%
Healthier and Comfortable Environment * University Group	105	83.3%	21	16.7%	126	100.0%
Pressure from NGOs * University Group	104	82.5%	22	17.5%	126	100.0%
Media Criticism * University Group	104	82.5%	22	17.5%	126	100.0%
Aspirational Drivers * University Group	104	82.5%	22	17.5%	126	100.0%
KPIs * University Group	105	83.3%	21	16.7%	126	100.0%

Report

Median

University Group	Climate Change	Do the Right Thing	Laws and Legislations	HEFCE	Organisational Policies	Energy Prices	Financial Savings	Reputation and Market Position	Staff and Students Recruitment	Healthier and Comfortable Environment	Pressure from NGOs	Media Criticism	Aspirational Drivers	KPIs
Pre-1992	3.50	4.00	5.00	4.00	3.00	5.00	5.00	4.00	3.00	3.00	2.00	2.00	3.00	3.00
Post-1992	3.00	4.00	4.50	4.00	3.00	4.50	5.00	4.00	3.00	3.00	3.00	2.00	3.00	4.00
Total	3.00	4.00	5.00	4.00	3.00	5.00	5.00	4.00	3.00	3.00	2.00	2.00	3.00	4.00

Both pre-1992 and post-1992 groups have almost the same median for each variable (driver). For example, the most important driver for carbon management 'Financial Savings' has median value '5' for both groups. This means that it is a major driver for carbon management in both pre-1992 and post-1992 universities and this complements the first phase findings.

Group differences of barriers

The survey ranked the barriers being faced by universities to implement carbon management. This section examines if the pre-1992 and post-1992 groups of universities perceive the barriers in different ways, as it could be possible that the barriers for one group of universities might not be barriers for the other group. Mann-Whitney U Test was performed to find this difference according to the level of importance. As stated above, the test generated 'Ranks' table presenting 'Mean Rank' values and 'Test Statistics' presenting 'Z' and significance values. The procedure of obtaining median score for the variables produces 'Case Processing Summary' and 'Report' tables.

Ranks				
	University Group	N	Mean Rank	Sum of Ranks
Lack of Capital Funding	Pre-1992	52	49.35	2566.00
	Post-1992	54	57.50	3105.00
	Total	106		
Lack of Time and Resources	Pre-1992	52	51.91	2699.50
	Post-1992	54	55.03	2971.50
	Total	106		
Senior Management Commitment	Pre-1992	52	50.69	2636.00
	Post-1992	53	55.26	2929.00
	Total	105		
Strong Policy Framework	Pre-1992	52	52.03	2705.50
	Post-1992	53	53.95	2859.50
	Total	105		
Financial Accounting Rules	Pre-1992	52	51.02	2653.00
	Post-1992	52	53.98	2807.00
	Total	104		
Growth	Pre-1992	52	53.72	2793.50
	Post-1992	53	52.29	2771.50
	Total	105		
Complex Buildings Stock	Pre-1992	52	58.02	3017.00
	Post-1992	53	48.08	2548.00
	Total	105		
Priority to Core Business	Pre-1992	52	54.87	2853.00
	Post-1992	53	51.17	2712.00
	Total	105		
Lack of Knowledge and Expertise	Pre-1992	52	54.53	2835.50
	Post-1992	53	51.50	2729.50
	Total	105		
Market Complexity	Pre-1992	51	49.58	2528.50
	Post-1992	53	55.31	2931.50
	Total	104		
Staff and Students Resistance	Pre-1992	52	50.31	2616.00
	Post-1992	53	55.64	2949.00
	Total	105		

Test Statistics[a]											
	Lack of Capital Funding	Lack of Time and Resources	Senior Management Commitment	Strong Policy Framework	Financial Accounting Rules	Growth	Complex Buildings Stock	Priority to Core Business	Lack of Knowledge and Expertise	Market Complexity	Staff and Students Resistance
Mann-Whitney U	1188.000	1321.500	1258.000	1327.500	1275.000	1340.500	1117.000	1281.000	1298.500	1202.500	1238.000
Wilcoxon W	2566.000	2699.500	2636.000	2705.500	2653.000	2771.500	2548.000	2712.000	2729.500	2528.500	2616.000
Z	-1.402	-.547	-.791	-.333	-.516	-.248	-1.725	-.649	-.532	-1.015	-.927
Asymp. Sig. (2-tailed)	.161	.584	.429	.739	.606	.804	.085	.517	.595	.310	.354
a. Grouping Variable: University Group											

In the above table 'Test Statistics', Z values and Significance (2-tailed) values are generated for each barrier. It is noticeable that significance value p>0.05 for all of the barriers to carbon management. thus, it is concluded that there is no significant difference between pre-1992 and post-1992 groups of universities in terms of barriers.

Case Processing Summary						
	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
Lack of Capital Funding * University Group	106	84.1%	20	15.9%	126	100.0%
Lack of Time and Resources * University Group	106	84.1%	20	15.9%	126	100.0%
Senior Management Commitment * University Group	105	83.3%	21	16.7%	126	100.0%
Strong Policy Framework * University Group	105	83.3%	21	16.7%	126	100.0%
Financial Accounting Rules * University Group	104	82.5%	22	17.5%	126	100.0%
Growth * University Group	105	83.3%	21	16.7%	126	100.0%
Complex Buildings Stock * University Group	105	83.3%	21	16.7%	126	100.0%
Priority to Core Business * University Group	105	83.3%	21	16.7%	126	100.0%
Lack of Knowledge and Expertise * University Group	105	83.3%	21	16.7%	126	100.0%
Market Complexity * University Group	104	82.5%	22	17.5%	126	100.0%
Staff and Students Resistance * University Group	105	83.3%	21	16.7%	126	100.0%

Report											
Median											
University Group	Lack of Capital Funding	Lack of Time and Resources	Senior Management Commitment	Strong Policy Framework	Financial Accounting Rules	Growth	Complex Buildings Stock	Priority to Core Business	Lack of Knowledge and Expertise	Market Complexity	Staff and Students Resistance
Pre-1992	3.00	4.00	3.00	3.00	2.00	4.00	4.00	3.00	2.00	2.00	3.00
Post-1992	4.00	4.00	3.00	3.00	2.50	4.00	3.00	3.00	2.00	2.00	3.00
Total	3.00	4.00	3.00	3.00	2.00	4.00	4.00	3.00	2.00	2.00	3.00

In the next step, median score of each barrier is calculated for both groups. The table 'Report' depicts the medians. Examining the above table reveals that medians for majority of the variables are same, but 'Lack of capital funding' and Complex Buildings stock' have different medians in both groups. Lack of capital funding is comparatively less of a barrier for pre-1992 universities than post-1992 as per the respondents. Moreover, pre-1992 universities find complex historical and listed buildings more of an issue in their carbon management process as compared to the post-1992 universities. In general, barriers appear to be common between both university groups. If post-1992 universities are

compared only with the Russell Group universities, then Mann-Whitney U Test produced the following results.

Ranks				
	University Group	N	Mean Rank	Sum of Ranks
Lack of Capital Funding	Russell Group	24	32.06	769.50
	Post-1992	54	42.81	2311.50
	Total	78		
Lack of Time and Resources	Russell Group	24	38.38	921.00
	Post-1992	54	40.00	2160.00
	Total	78		
Senior Management Commitment	Russell Group	24	34.46	827.00
	Post-1992	53	41.06	2176.00
	Total	77		
Strong Policy Framework	Russell Group	24	36.29	871.00
	Post-1992	53	40.23	2132.00
	Total	77		
Financial Accounting Rules	Russell Group	24	36.98	887.50
	Post-1992	52	39.20	2038.50
	Total	76		
Growth	Russell Group	24	45.54	1093.00
	Post-1992	53	36.04	1910.00
	Total	77		
Complex Buildings Stock	Russell Group	24	47.88	1149.00
	Post-1992	53	34.98	1854.00
	Total	77		
Priority to Core Business	Russell Group	24	39.63	951.00
	Post-1992	53	38.72	2052.00
	Total	77		
Lack of Knowledge and Expertise	Russell Group	24	39.96	959.00
	Post-1992	53	38.57	2044.00
	Total	77		
Market Complexity	Russell Group	24	33.85	812.50
	Post-1992	53	41.33	2190.50
	Total	77		
Staff and Students Resistance	Russell Group	24	32.08	770.00
	Post-1992	53	42.13	2233.00
	Total	77		

Test Statistics[a]											
	Lack of Capital Funding	Lack of Time and Resources	Senior Management Commitment	Strong Policy Framework	Financial Accounting Rules	Growth	Complex Buildings Stock	Priority to Core Business	Lack of Knowledge and Expertise	Market Complexity	Staff and Students Resistance
Mann-Whitney U	469.500	621.000	527.000	571.000	587.500	479.000	423.000	621.000	613.000	512.500	470.000
Wilcoxon W	769.500	921.000	827.000	871.000	887.500	1910.000	1854.000	2052.000	2044.000	812.500	770.000
Z	-1.982	-.307	-1.235	-.735	-.419	-1.798	-2.418	-.173	-.265	-1.417	-1.895
Asymp. Sig. (2-tailed)	.048	.759	.217	.462	.675	.072	.016	.863	.791	.157	.058
a. Grouping Variable: University Group											

The above table reveals that 'Lack of capital funding' in Russell Group universities (Mean-32.06, N=24) is significantly different, a barrier of less importance, than the post-1992 universities

(Mean=42.81, N-54), Mann-Whitney U=469.500, Z=-1.982, p=0.048<0.05. From the statistics, it can be concluded that lack of capital funding is less important in Russell Group universities. Similarly, 'Complex buildings stock (historical and listed buildings)' is a barrier of high importance in Russell Group universities (Mean=47.88, N=24) than post-1992 universities (Mean=34.98, N-53), U=423.000, Z=-2.418, p=0.016<0.05.

Appendix 10: Carbon management policies and strategies at DMU (Chapter 7)

Carbon management related policies and strategies

DMU has developed policies and strategies in different areas of carbon emissions to implement SCM. This section presents analysis of policies and strategies outlined below.

- Sustainability strategy
- Environmental policy
- Energy policy
- Carbon management plan
- Green travel plan
- Waste management policy
- Sustainable procurement policy

Sustainability strategy: In February 2009, the Executive Board (EB) agreed a sustainability strategy (2008 - 2012). The strategy was aimed to incorporate sustainability into the core activities of the university such as teaching, research, built environment, health and wellbeing and community engagement. 'Carbon' is directly linked with the theme 'Built Environment: Being Sustainability' and indirectly with the other themes. The strategy included monitoring, evaluating and reporting of carbon emissions. DMU seeks not only to comply with current sustainability guidelines, but to become a leader in this area, as stated in the strategic plan 2011-15. The role of sustainability is changed in the new strategic framework. The current sustainability strategy is expired and requires renewing and refreshing. The consultation process was undertaken and the new strategy was developed, which is in the process of executive approval. DMU has developed a separate strategy to bring sustainable development activities together, but the aim is to integrate sustainability into all of the policies and strategies. However, this has not been achieved yet. The draft of the sustainable development strategy 2015-19 (p. 4) states:

> *"Ideally we do not want a separate sustainable development strategy, rather that sustainable development is integrated into all DMU polices and strategies. However, a summary document is necessary to bring together sustainable development activities and the work of the Sustainable Development Task Force"*

Environmental policy: Environmental policy is a key part of the sustainability strategy. DMU is committed to improve its environmental performance through effective environmental management practices. DMU's environmental policy sets out the university's overarching commitments to environmental management and the steps it needs to take to reduce its environmental impact at local, regional, national and global level to improve environmental performance. The environmental policy provides an overarching policy support to SCM. This policy was revised and approved by the EB in January 2012. The environmental policy proposes to adopt a strategic and an operational approach to reducing and managing greenhouse gas (carbon) emissions (DMU, 2015b). This appears to be a comprehensive policy which looks at all areas of environmental and carbon management. However, the policy states to incorporate environmental responsibility into all of the job descriptions, but this is not done yet according to the Director of People and Organisational Development (POD) suggesting a gap between the policy and practice.

Energy Policy: DMU is committed to reduce the environmental impact of its energy and water consumption and improve the management of its usage (DMU, 2012). The energy policy recognises the strategic importance of energy and water management and its implications for carbon management. It includes energy and water saving strategy and a set of standards for DMU. The energy policy covers scope 1 (excluding vehicle fuel use) and scope 2 emissions. The main responsibility for the energy policy is with the VC, but the Energy Manager is responsible for the development, implementation and review of it.

Carbon management plan: DMU produced its first carbon management plan (CMP) in 2009 to respond the HEFCE policy and strategy. The CMP sets DMU's plan to reduce emissions from its business operations. It presents the university's carbon footprint, targets and projects to help meet the targets (DMU, 2011b). Personal experience and observations within DMU suggests that the current CMP is not engaging and has complex technical details which stakeholders (staff and students) might not understand. It does not address the right audience within the university and the Environmental and Sustainability Officer agreed to this view during an informal discussion. DMU's current CMP is expired and is being reviewed to renew the targets and projects. This will provide an opportunity to reassess the planned projects which are completed and to identify new projects to be implemented. The CMP is analysed in detail alongside other universities in Chapter 5. The majority of the survey respondents (6 agree and 1 strongly agree out of 8 respondents) reported that DMU's CMP is effective, based on their experience at DMU and being involved in the process in different roles. As part of comprehensive carbon management strategy in scope 1-3, DMU does not have separate strategies for each area of emissions and the CMP covers all areas as an overarching document. Furthermore, there are projects in the current CMP, which are not completed yet, such as PC switch off software and the district heating scheme. This suggests disconnect between planning process and its practical implementation.

Green travel plan: The green travel plan aims to encourage university staff and students to use less carbon intensive modes of travel and transport such as public transport, cycling, walking and shuttle buses. It aims to reduce reliance on cars through a range of initiatives (DMU, 2015f). This also plans to promote multiple occupancy of vehicle and avoidance of duplication of journeys including the car sharing scheme and park and ride facilities. Where vehicles are hired, purchased or leased by university staff, it encourages the use of small, low-emission and efficient engines and possibly electric vehicles. DMU has been conducting annual travel surveys since 2004 to monitor its progress and assess staff and students' behaviour change. DMU is committed to sustainable forms of transport in its Vehicle Parking and Cycle Policy to reduce emissions.

Waste management policy: In the waste management policy, DMU is committed to the improvement of waste management practices with a reduction in the amount of waste sent to landfill. This is being carried out by adopting the waste management hierarchy as part of the carbon management. The waste hierarchy encourages the university to reduce at source, re-use and repair, recycle and responsibly dispose (DMU, 2015d). In 2012, a recycling scheme was established which involved all of the faculties and departments. Initially, it started with only recycling paper and reusing envelopes, but it was extended to recyclable materials and reducing the waste sent to landfill. DMU seems to be advancing its recycling initiatives. The amount of waste that the university produces continues to fall and the amount of waste sent for recycling is increasing. Furthermore, the range of materials that can be recycled are also increased (DMU, 2015a).

Sustainable procurement policy: DMU has a sustainable procurement policy aiming to integrate environmental sustainability and carbon management into its procurement activities. The university aims to achieve this through contracts specifications and working with its suppliers. In this policy, DMU recognises that procurement have significant environmental, social and economic impact and the significance of incorporating carbon management into procurement decision-making. The policy applies to procurement of goods and services. Despite this, emissions are increasing (see Figure 40). All other policies are publicly available on the website, but the sustainable procurement policy is not publicly available and is out of date. An email was sent to the Environmental and Sustainability Officer to find out about the existence of this policy.

> *"It will be reviewed fairly shortly as it's quite out of date. It was put together by the procurement team several years ago. I think it was formally adopted in 2009. I have been speaking to the procurement team about reviewing the policy and rewriting it which I think will happen in the next few months along with some other work around sustainable procurement"* [Environmental and Sustainability Officer] [Dated: 30/06/2015]

Carbon management trends at DMU

DMU has been monitoring and reporting carbon emissions from energy use, scope 1 and cope 2, since 2005/06. The university has also measured its scope 3 emissions. DMU's total emissions have increased in 2012/13 from scope 1 and 2 (primarily energy use) and scope 3 sources. Within the scope

3 sources, emissions have risen slightly from business travel and procurement. The procurement related emissions are as a result of increased expenditure on ICT (DMU, 2015h). Figure 36 shows the trend in carbon emissions since 2005/06. Overall, this shows the downward trend in scope 1 and 2 emissions from 2005 to 2013, but this is almost constant over the last few years. Electricity consumption is the main contributor to these emissions.

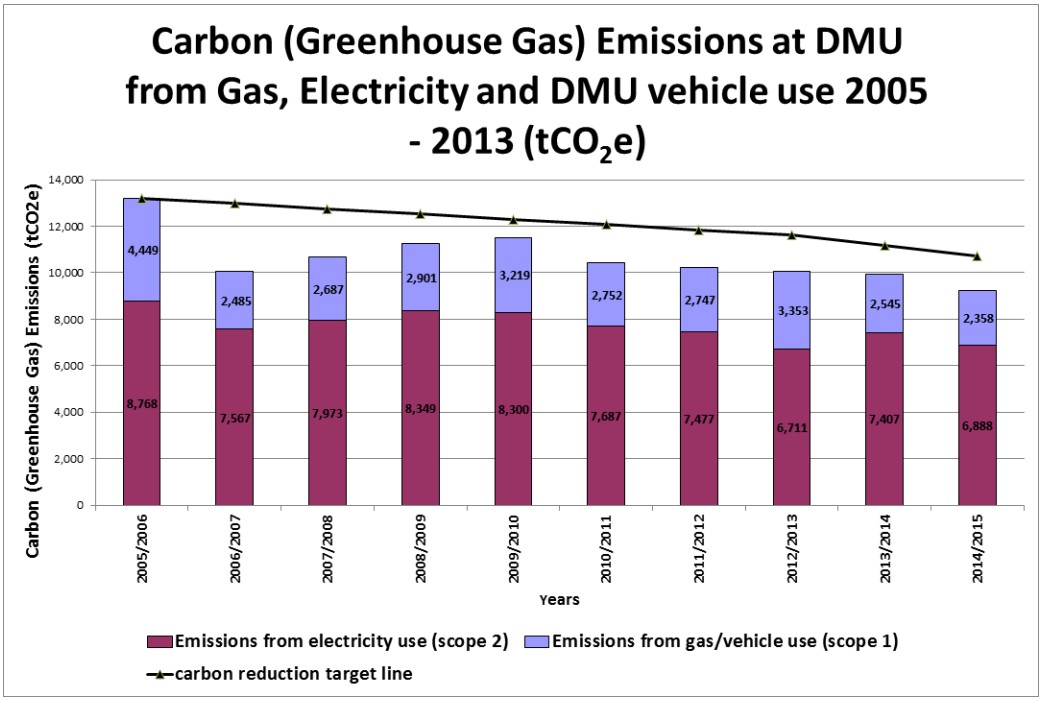


Figure 36: Carbon emissions from gas, electricity and vehicle use 2005-2013 (tCO_2e) (DMU, 2015h)

Brite Green, a sustainability strategy consultancy, carried out analysis of the carbon emissions in the UK HE sector and also produced individual university reports on their total emissions and performance against the targets. Table 82 presents DMU's direct emissions in the previous year. DMU has managed a reduction of 25% from 2005 to 2012, which is significant progress.

Carbon reduction target (%)	Total Emissions (tCO_2)							% change from 2005 to 2013
	2005 baseline	2008 baseline	2008/09	2009/10	2010/11	2011/12	2012/13 (tCO_2e)	
43	13,150	11,135	11,136	11,826	9,900	9,640	9,858	-25%

Table 82: Carbon reduction performance summary (Brite Green, 2015)

Scope 3 related emissions are overlooked, but can account for the majority of an organisation's total carbon footprint. In the case of DMU, scope 3 sources account for approximately 75% of the university's carbon footprint. Figure 37 shows how different sources of emissions contribute to the

carbon footprint of DMU in 2005/6 (DMU, 2015h). The figure shows that procurement is a major contributor followed by staff and student commute and the use of electricity.

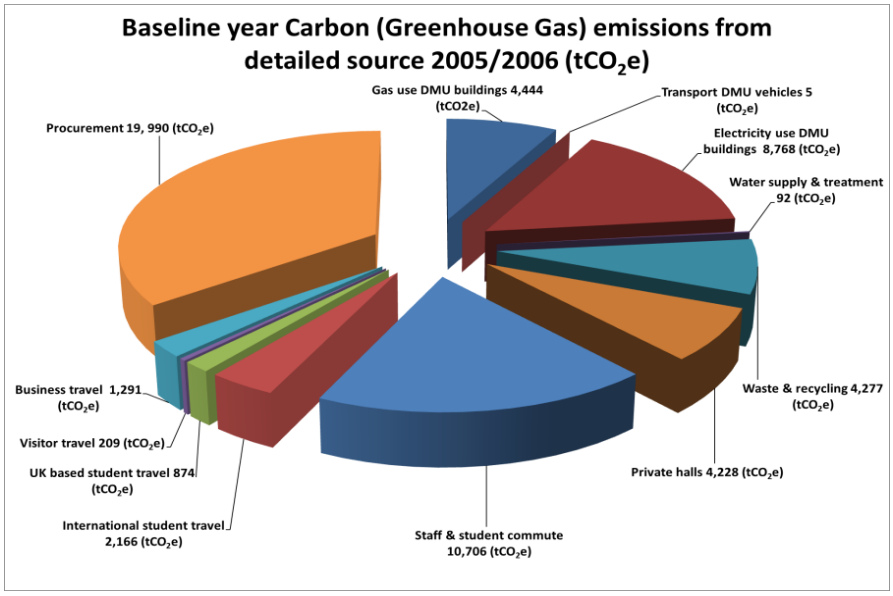


Figure 37: Baseline year emissions from detailed source 2005/2006 (tCO_2e) (DMU, 2015h)

Figure 38 below distributes scope 1-3 emissions into different categories. It shows the extent to which scope 3 contribute to the carbon footprint of DMU since 2005/6 (DMU, 2015h). The figure illustrates that the majority of emissions come from indirect scope 3 sources. The top end of the bars demonstrates procurement emissions and the bottom end illustrates energy related emissions. Energy use has been constant over the last three years and procurement emissions have reduced in last three years, but increased again in 2013/14 as a result of the increased spend through the supply chain for the campus redevelopment. Thus, overall, progress has been slow in scope 1-3 carbon management

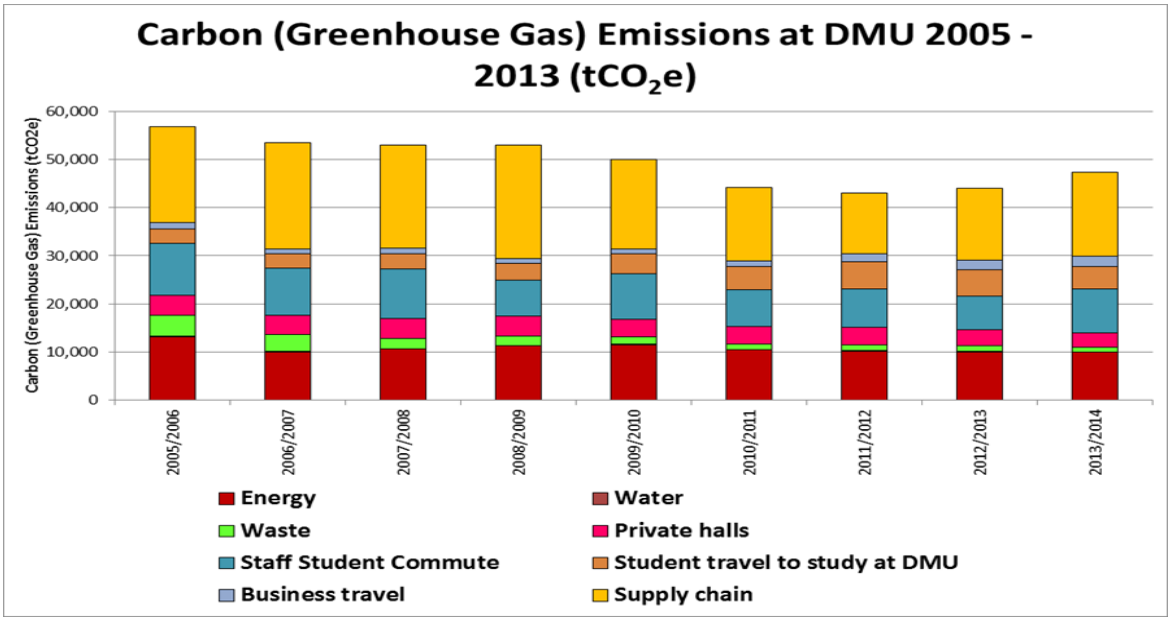


Figure 38: Carbon emissions from scope 1-3 at DMU 2005-2014 (tCO2e) (DMU, 2015h)

Scope 3 carbon management

Scope 3 carbon management is an important theme, as explored in the first phase of the research. This section discusses indirect travel and procurement related scope 3 emissions; however, the focus remains on procurement because of its major contribution in the scope 3 emissions. DMU carried out the first assessment of the university's total carbon emissions and it shows a significant portion of scope 3 emissions and is growing. This carbon footprinting methodology is available for other universities globally to carry out a consumption-based carbon footprinting analysis; however, more accurate data are needed in some of the areas of emissions, particularly travel emissions (Ozawa-Meida, 2013). Four of the interviewees discussed issues associated with scope 3 emissions. This is part of the carbon reduction targets now. The PVC argued that the university can influence scope 3 emissions, but it is difficult part of the carbon management process. The university needs to be innovative about the ways to manage scope 3 emissions, as there are tensions between scope 3 carbon management and business activities, as already discussed in Chapter 7. The university does not have a direct influence on scope 3 carbon management, like scope 1 and 2. The PVC was asked about the value of scope 3 to DMU and the university's influence on carbon management.

> *"Scope 3 is the most difficult one, but I think we can influence. It is difficult for us. There are tensions as a university, for example, air travel that is one of the big carbon emitters for staff and one of the things we are doing as a university is DMUglobal, which is encouraging up to 505 of our students to have an international experience which surely is going to increase scope 3 rather than decrease"* [Pro Vice Chancellor]

The above quotation suggests that scope 3 emissions are difficult to manage, but the university can influence it. The tensions between scope 3 carbon management and business activities are the main problems due to international outreach; however, it cannot be ignored. In order to deal with staff and student commuting, the annual travel survey is conducted to explore travel behaviour of staff and students. Staff and students are encouraged to use public transport through the negotiation of discounts with local and national operators and through the work of SmartGo Leicester. They are encouraged to use walking, cycling and car sharing through the use of promotional items such as high visibility clothing, secure cycle parking, cycle lock loans, puncture repairs kits and the provision of changing and shower facilities across the campus. DMU offers free park and ride to staff. As far as business travel is concerned, there seems to be no joined up strategy at an organisational level.

Procurement

Procurement is a significant part of scope 3 emissions. The Director of Estates and Commercial Services stated that the estates department tends to buy sustainably to reduce emissions, but this is not always possible due to various issues such as price difference and location. There are other departments that might not consider carbon management into their purchasing. The Director of Finance at DMU explained that every directorate and faculty has a devolved budget and they have autonomy to spend the budget within the rules and framework. This illustrates their impact on low

carbon procurement. However, the estates department tries to integrate carbon factor in their procurement activities. The Director of Estates raised an issue of sustainable products being expensive and stated financial bottom line of business is important.

> *"There are frustrations, for example, that prevent you from just forgetting totally about sustainability. Somebody could go out and buy something that is half the price of similar item, but costs twice as much in carbon terms of manufacturing and it can also cost a lot more in carbon journey in its life time"* [Director of Estates]

The quotation illustrates that sometimes, carbon intensive products are cheap and departments could buy them, whereas low carbon products could be expensive. As far as the integration of carbon management into procurement is concerned, the following extract demonstrates the extent carbon management is considered in the ITMS's procurement activities. This reflects that carbon management is not integrated into procurement across the university. The Head of IT Operations was of the view that the central procurement department does not support it.

Researcher: Do you have carbon considerations in procuring IT equipment?
Head of IT Operations: I think the answer is no and that's not from the ITMS perspective. That is the fact that the procurement that we currently run, does not support it. So when we procure goods and services for the university, it does not support thinking about sustainability. I am talking about across the board in the university.

Table 83: Interview extract demonstrating carbon management into procurement

There is not considerable integration of carbon management into procurement. The Head of IT Operations was of the view that we are buying many products and services, but there is no consideration of carbon or environmental impact. He stated that *"nobody thinks about it and nobody has done anything about it".* The same was found when the Deputy Procurement Manager was interviewed in the first phase of the research. The Energy Manager agreed on the impact of the university on reducing its procurement emissions.

> *"I think they can, depending on whether the procurement people are interested in reduction. I think DMU has worked well with a consultant and developed a scope 3 emissions data which is quite good"* [Energy Manager]

In the second phase, the Director of Finance was interviewed to explore financial issues related to carbon management and the role of procurement. The Director of Finance stated that low carbon procurement is an area where DMU needs to improve. However, the Director of Finance was not aware of the low carbon/sustainable procurement policy and/or ethical investment policy and went on saying that the Head of Procurement would know about it. This demonstrates a lack of communication and engagement within the department. The following extract demonstrates the extent carbon management is embedded in the procurement process. According to the Director of Estates, it is not embedded into procurement activities and decision-making and not on the agenda of the procurement department and there is a lack of understanding.

Researcher: Do you think that sustainability, particularly environmental part of sustainability, is embedded in the procurement process at DMU?

Director of Finance: I don't think it is embedded. I think there is more to do. I don't think it is understood. Just so you get some context, we are transforming procurement within the institution. So, I don't think we understand necessarily procurement, what that means in terms of how it can drive value for money. Therefore, I don't think we can link that, fully understand, how procurement can enhance sustainability either. It's a lot of work to do on procurement in the institution. So, I think people see procurement almost as a reacquisition, procurement team raising an order. So, I don't think they necessarily see the benefits that procurement can bring. I am not suggesting that our procurement team don't understand sustainability. I just think in broader and broader institution, there is not enough knowledge on the significance of procurement, not fully embedded.

Researcher: What can you do more to embed low carbon procurement within DMU?

Director of Finance: It's not on the agenda right at the moment. We are transforming procurement in terms of how do we ensure or improve the function to improve value for money. I think when we have done this; we can perhaps overlay that with this agenda. There is a level of competence at the moment within the institution.

Table 84: Interview extract demonstrating carbon management into procurement

The Research Fellow agreed with the Director of Finance:

> *"Although GHG emissions from procurement and other sources have been measured for several years, I think carbon management has not been integrated fully in the procurement process and decision-making. It may be considered in some areas, such as energy, but it is not transparent if the procurement of construction works, IT equipment, etc. consider environmental aspects (such as energy efficiency, low carbon materials, etc.)"* [Research Fellow]

The Head of IT Operations argued that there is a lack of clear responsibility for scope 3 carbon management and it is uncertain between estates and procurement departments. The energy policy encourages low carbon procurement and states *"new equipment purchased by Procurement or individual departments should be energy efficient. Where appropriate, the equipment should be purchased with appropriate EU energy labelling scheme. All equipment procurement shall aspire to A++ rating or if not then a statement why it wasn't could be produce"* (DMU, 2012, p. 5). There seems to be lack of coordination between the estates and procurement departments. The work is underway to gain Level 2 of the Flexible Framework in sustainable procurement by December 2015. Environmental managers are trying to work closely with the procurement department; however, the progress has been slow. The Environmental and Sustainability Officer has been discussing with the Head of Procurement to embed carbon management into procurement. Furthermore, the survey results show that carbon management is not integrated into the procurement process, as five of the respondents 'neither agree nor disagree' and two respondents 'disagree'.

At the SDTF meeting in June 2014, it was discussed to ensure low carbon procurement and that the university works toward achieving Level 2 of the Flexible Framework, which is a self-assessment tool to allow organisations measure and monitor their performances of sustainable procurement. It is proposed that the scope of the existing Fairtrade Steering Group is expanded to include sustainable procurement. This group would report back to the SDTF through a standing agenda item on sustainable procurement. However, sustainable procurement is incorporated within the major

contracts and agreements made by the university. Through mechanisms such as Pre-Qualification Questionnaires (PQQ) and contract specifications, contract requirements are developed to ensure that contractors have required environmental credentials and use products and services with lower carbon impact. DMU's PQQ has four questions relating to Corporate Social Responsibility and do not address environmental sustainability and carbon management in particular. Two samples of the PQQ were investigated and there were four environmental/sustainability related questions only. These tools may have limited role to embed carbon management and there is not any check and balance on the responses.

Appendix 11: Environmental data 2013/14 of DMU (Chapter 7)

The environmental data of DMU for 2013/14 is presented in this appendix (DMU, 2015a). Overall, the data in the tables below is encouraging and shows sustained but slow improvements across a wide range of environmental activities and carbon emissions at DMU.

ENERGY

Indicators/metrics	2009/10	2010/11	2011/12	2012/13	2013/14
Energy use (*MWh)	33,135	29,452	28,489	33,209	28,554
Electricity use (MWh)	15,820	14,652	13,713	15,064	14,986
Gas use (MWh)	17,315	14,800	14,776	18,145	13,668
Water use (m3)	58,977	60,565	71,131	77,256	75,527
Energy generated from renewables (MWh)	149	379	223	211	138
Fuel used in DMU vehicles (litres)	4,772	4,399	4,408	5025	6,457
Residential & non-residential GIA with display energy certificate rating A–C	44,339	68,566	79,220	86,695	90,524
% residential & non-residential GIA with display energy certificate rating A–C	26%	43%	52%	57%	67%

*MWh = 1000kWh

TRANSPORT

Indicators/metrics	2009/10	2010/11	2011/12	2012/13	2013/14
% Single occupancy car use (staff)	47%	45%	42%	47%	40%
% Single occupancy car use (students)	13%	13%	15%	10%	14%
% Staff travel by public transport	21%	20%	20%	19%	20%
% Staff travel by cycling	9%	9%	11%	9%	12%
% Staff travel by walking/running	13%	13%	14%	15%	17%

WASTE AND RECYCLING

Indicators/metrics	2009/10	2010/11	2011/12	2012/13	2013/14
Total waste produced – non-residential (tonnes)	809	634	663	612	553
Waste recycled – non-residential (tonnes)	363	257	326	366	428
Waste to landfill – non-residential (tonnes)	447	378	337	246	125
Total waste produced – residential (tonnes)	234	234	234	234	179
Waste recycled – residential (tonnes)	56	56	56	56	57
Waste to landfill – residential (tonnes)	177	177	177	177	122

GREENHOUSE GAS EMISSIONS

Indicators/metrics	2009/10	2010/11	2011/12	2012/13	2013/14
Emissions from energy & DMU owned vehicles scope 1 & 2) (tCO2e)	11,519	10,439	10,224	10,064	9,952
Emissions from staff & student commute (scope 3) (tCO2e)	9,412	7,556	8,120	6,919	9,160
Emissions from business travel (scope 3) (tCO2e)	1,088	1,250	1,620	1,935	2,189
Emissions from waste & water (scope 3) (tCO2e)	1,523	1,186	1,174	1,222	970
Emissions from international & UK student travel (scope 3) (tCO2e)	4,032	4,789	5,588	5,525	4,517
Emissions from procurement activities (tCO2e)	18,596	15,180	12,662	14,981	17,486
Emissions from all scope 3 sources (tCO2e)	38,609	33,807	33,065	34,197	37,584
Total Emissions - scope 1, 2 & 3 sources (tCO2e)	50,128	44,246	43,289	44,261	47,536

BUSINESS TRAVEL

Indicators/metrics	2009/10	2010/11	2011/12	2012/13	2013/14
Air travel (tCO2e)	745	908	1,249	1.603	1,769
Rail travel (tCO2e)	203	200	187	156	172
Maritime (tCO2e)	0	0	0	0	0
Road travel (tCO2e)	140	143	184	176	243